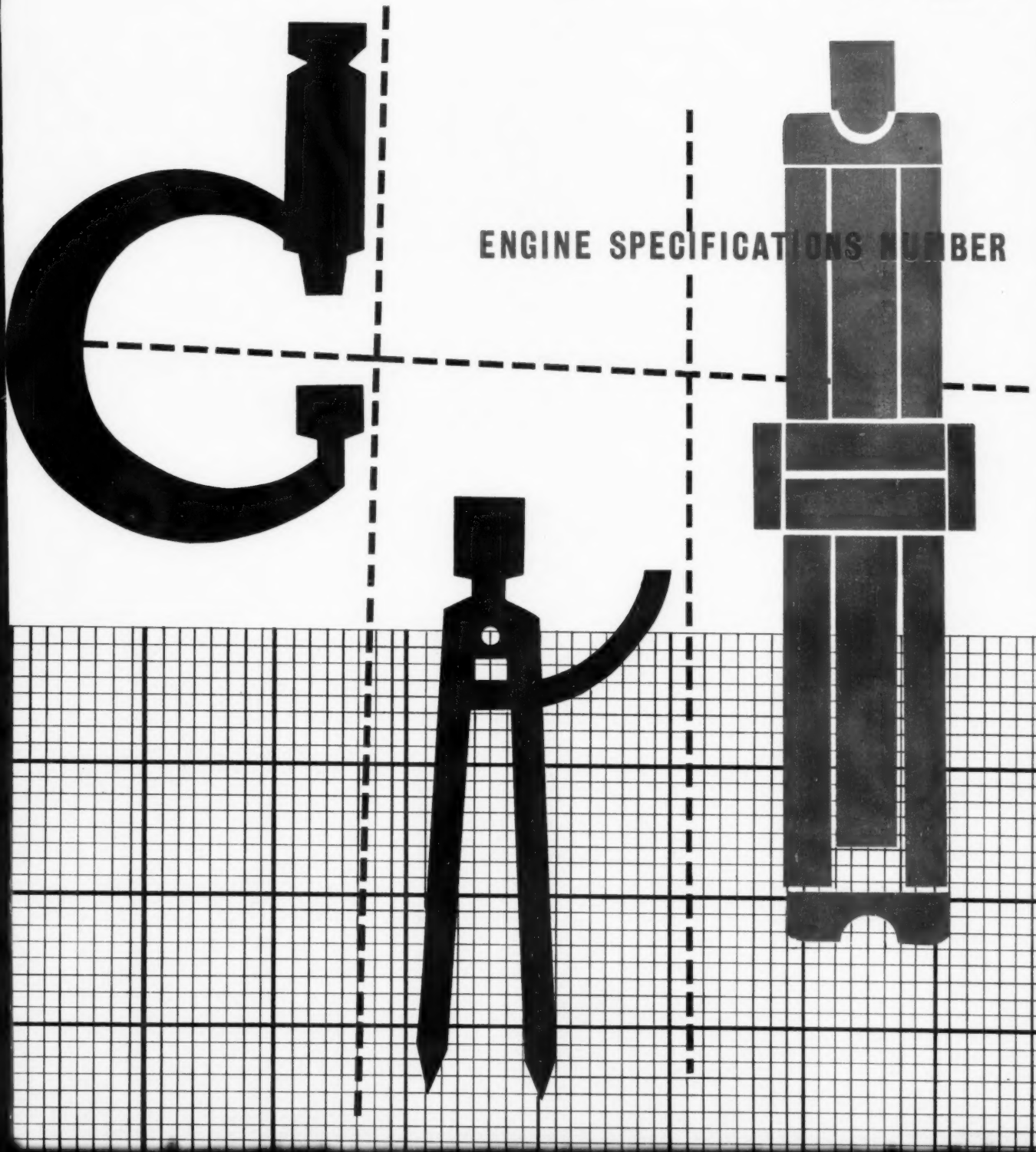
diesel power

APRIL 1954



ENGINE SPECIFICATIONS NUMBER

REMARKABLY CLEAN OPERATION

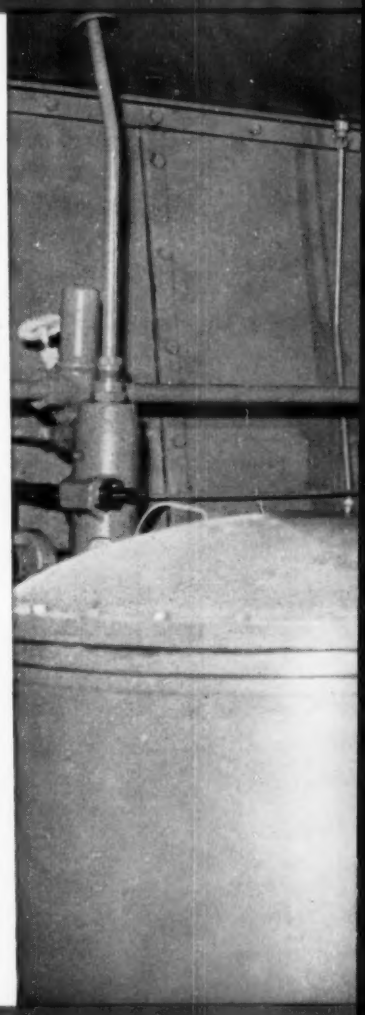
FOR 20 YEARS the Texaco-lubricated diesels in this New Mexico plant (name on request) have run remarkably clean. There has been a minimum amount of wear. Maintenance costs and fuel consumption have been consistently low.

To assure similar benefits, lubricate your engines with one of the famous *Texaco Ursa Oil* series — a complete line of lubricating oils especially refined to make diesel, gas and dual-fuel engines give *more power* with *less fuel* over *longer periods* between overhauls.

The *Texaco Ursa Oil* series is approved by leading engine builders and preferred by operators everywhere. In fact —

> *For over 20 years, more stationary diesel horsepower in the U.S. has been lubricated with Texaco than with any other brand.*

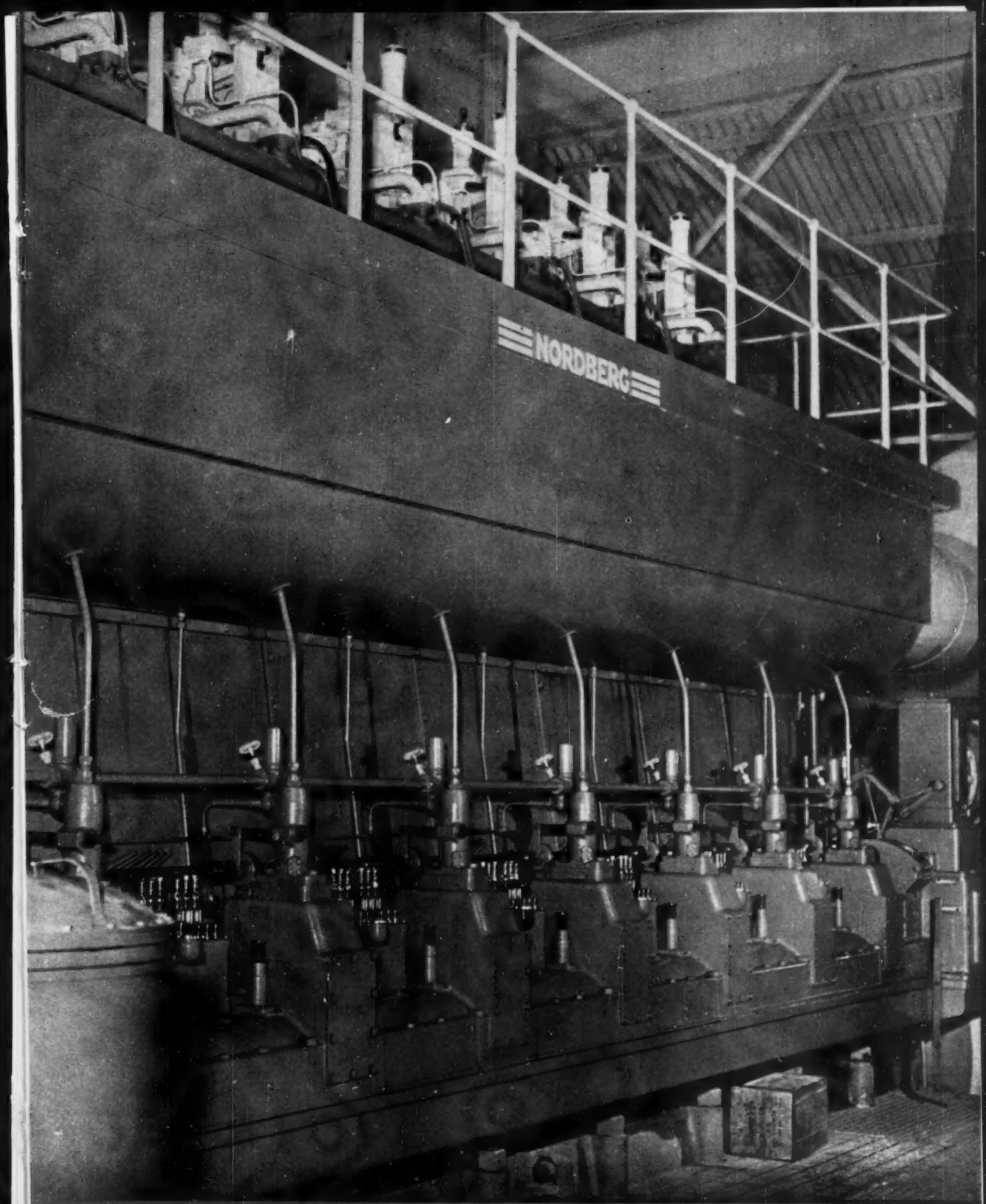
Let a Texaco Lubrication Engineer help you get top performance from your engines. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.



TUNE IN:
METROPOLITAN OPERA
radio broadcasts
every Saturday afternoon.
See newspaper for
time and station.

TEXACO

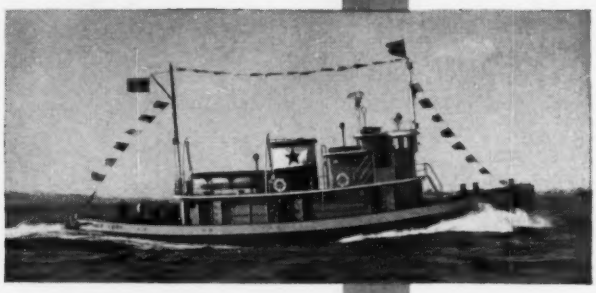
TEXACO



URSA OILS

FOR ALL DIESEL, GAS AND DUAL-FUEL ENGINES

RED STAR TOWING AND TRANSPORTATION COMPANY



Mr. T. W. Drennen, Manager
Fairbanks, Morse & Co.
80 Broad Street
New York 4, N. Y.

Dear Mr. Drennen:

As operators of a fleet of tugs for harbor and coastwise service for over seventy years, we have had experience with practically all types of propulsion machinery. We have operated Fairbanks-Morse Diesel engines in our boats for the past twenty-six years.

In service such as ours, stamina and dependability are a must. Ease of servicing, plus low maintenance, and most important, maneuverability have also been features of your engines. We would unhesitatingly recommend these engines to anyone requiring heavy duty, dependable Marine service.

One of the most modern tugs in our present fleet of sixteen tugs is the "HUNTINGTON" powered with your 8-cylinder, 1280 HP, Opposed Piston Marine engine. This tug has been outstanding in every type of service in which we have used it.

Ours is a tough business, but yours is a tough engine.

Sincerely yours,

Chester H. Sanders

Chester H. Sanders,
PRESIDENT

"You'll be enthusiastic, too, about Fairbanks-Morse diesel performance"

Fairbanks, Morse & Co., Chicago 5, Illinois

FAIRBANKS-MORSE
a name worth remembering when you want the best

DIESEL AND DUAL FUEL ENGINES • DIESEL LOCOMOTIVES • RAIL CARS • ELECTRICAL MACHINERY • PUMPS • SCALES • HOME WATER SERVICE EQUIPMENT • FARM MACHINERY • MAGNETOS

Brian P. Emerson
Editor

John H. Wetherell, Jr.
Associate Editor

S. A. Zegar
Assistant Editor

C. W. Kinnear
Railroad Editor

George R. Brighton
President

James E. Jones
Vice President & Treas.

Arnold B. Newell ,
Vice President

Arthur N. Goding
Business Mgr.

Lucille M. Carty
Circulation Mgr.

Frieda L. Hoffenberg
Production Mgr.

Milton J. Wynne
Art Director

M. D. Pugh—Pacific Coast Mgr.
2721 N. Marengo Ave.
Altadena, Calif.

Fred M. Wright Company
South Western Representative
411 No. 10th, St. Louis, Mo.
505 North Erway, Dallas, Texas

Newspaper Representation Ltd.
British Representative
231 Strand,
London, W. C. 2, England

Georg J. Linder
German Representative
Wittelsbacher Allee 60
Frankfort/Main, Germany

Publisher
G. Renfrew Brighton

Assistant Publisher
Wilbur W. Young

Subscription Rates

	Single Copies	1 year	2 years	3 years
U. S.	35¢	$3.00	$5.00	$ 6.00
Canada	40¢	4.00	7.00	9.00
Foreign	40¢	5.00	8.00	11.00

Diesel Power is indexed regularly by Engineering Index, Inc. and is available in microfilm editions from University Microfilms, Inc., Ann Arbor, Michigan.

DIESEL POWER for April, 1954. Vol. XXXII, No. 4. It is published monthly by Diesel Publication, Inc., Kutztown, Pa. Executive and Editorial Offices at 192 Lexington Ave., New York 16, N. Y. Tel. MUrray Hill 3-9874. Entered as second class matter at the Post Office, Kutztown, Pa., under Act of March 3, 1879. Copyright 1954, Diesel Publications, Inc.

diesel power

Established in 1923 **Vol. 32, No. 4** **April, 1954**

Editorial

Conservation or Conversation? 65

Special Feature

1954 Diesel Engine Specifications 85

Articles

A "First" for Fredonia 68
Turbocharging the Two-Cycle Gas Engine 70
Improved D-8 Marks "Cat's" 50th Year 73
Oil Filtration and Purification 74
More Power for P&H Engines 81
Transportable Power 82
World's Largest Engine 101
Versatile Calibrating Stand 102
Control Wheel Slip to Reduce Flashovers 104
Series "71" Injector Changes 108
Bobbers for Force-Feed Lubricator Calibration 110

Departments

Highlights 67
What Do You Know! 109
Straight from the Tool Box 112
News of Our Industry 113
Ad Index 148

Diesel Publications, Inc., 192 Lexington Avenue, New York 16, N. Y.

Cable Address: Dieselpub — New York

This Month's Cover

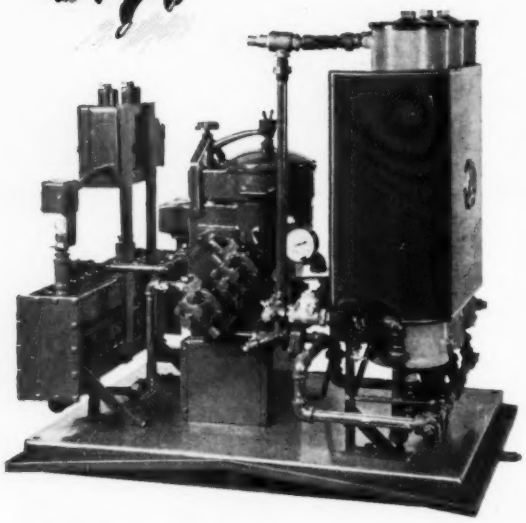
Bold symbols of design tools are used to create a forceful image for recognition of the April Engine Specifications number.

A Great Double-Play Combination!

THE CENTRIFUGE AND THE FILTER

The De Laval "Puri-Filter" combines centrifugal purification and micronic filtration, producing the most effective means ever devised for maintaining the quality of diesel lubricating oil. The centrifuge is the De Laval "Uni-Matic"® Oil Purifier, which removes most of the solid impurities from the oil and all water that might be present. The filter is the Fram "Filcron" Filter that removes remaining colloidal carbon and restores the oil to a translucent amber color.

The "Puri-Filter" ***does not*** remove valuable additives in the oil. By effecting its valuable "double-play" cleansing of lubricating oil, it increases the useful life of the oil . . . and the life of the bearings as well. It minimizes ring sticking, and speeds up inspection, for crankcases are markedly cleaner when the oil is kept free of carbon, water and dirt.



THE DE LAVAL SEPARATOR COMPANY
Chicago POUGHKEEPSIE, N.Y. San Francisco

● Send for Bulletin DL-1.

DE LAVAL *Oil Purifiers*

FOR DIESEL LUBRICATING OIL

150-ft. spud barge *A. H. Stall*, with its Cooper-Bessemer-powered Bucyrus-Erie 200-W dragline, is owned and operated by J. Ray McDermott & Co., Harvey, La., and has been in highly successful use on various excavating jobs since January 1951. On this operation the unit is swinging a 6-yd. clamshell bucket on a specially extended 140-ft. boom.

THIS big barge-mounted Bucyrus-Erie dragline, Cooper-Bessemer-powered, is working month after month, 24 hours a day in the swamplands below New Orleans. Here, with this machine, J. Ray McDermott & Company is moving almost 3 million yards of muck to build an endless levee for two huge fresh water reservoirs. In turn, these reservoirs will store millions of gallons of fresh Mississippi water for the mining of sulphur in a vast new dome beneath the marshes.

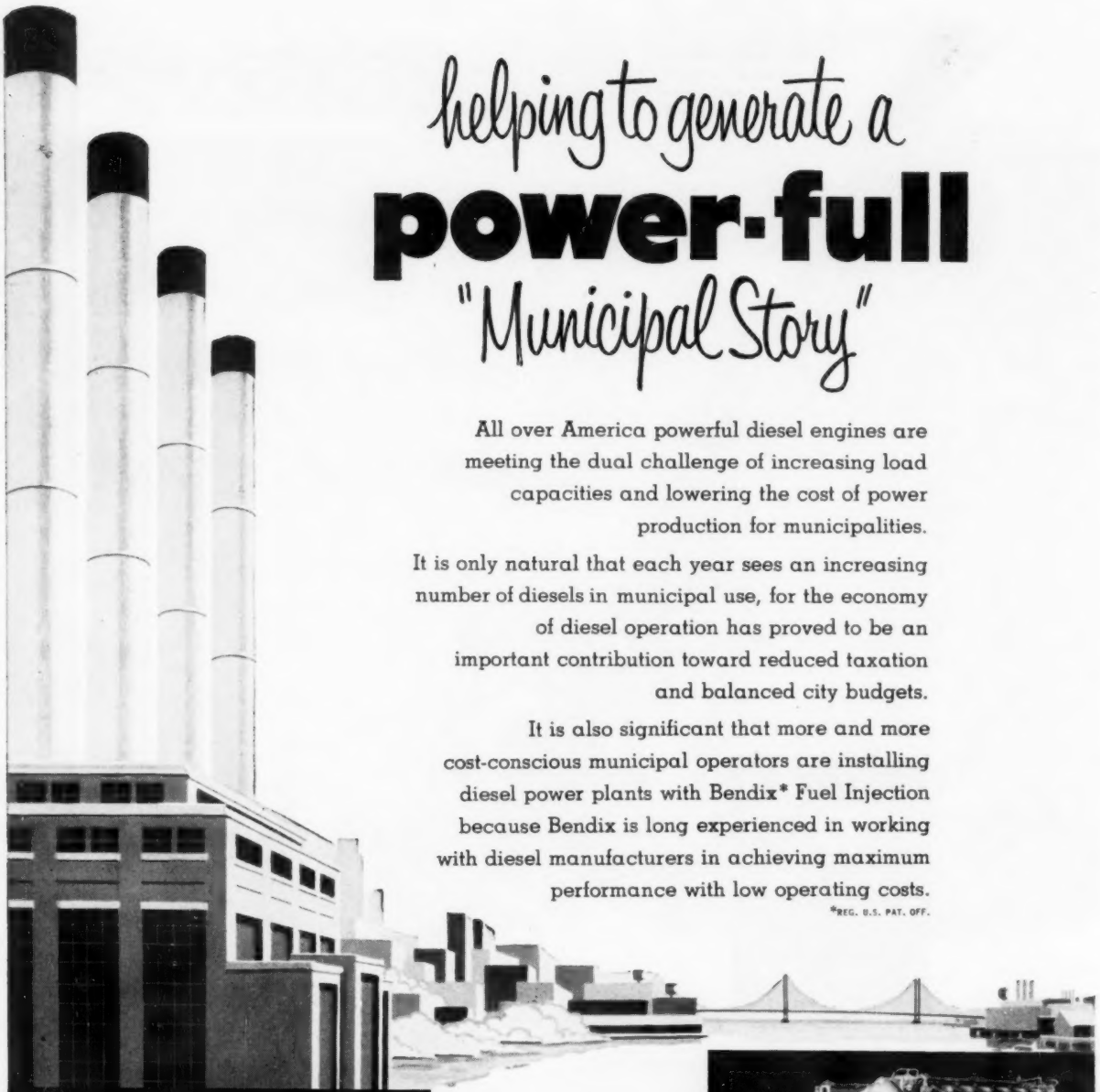
The levee will be 6 miles long, 100 feet wide at the base, and 12 feet high with a 10-ft. crown — an 8- or 9-month excavating job! And on a big, hard-to-reach job like this you soon learn the *extra* value of diesel power you can count on for continuous, trouble-free performance.

Cooper-Bessemer diesels are designed for all kinds of service. They're your best bet when it comes to heavy-duty power.

The
Cooper-Bessemer
Corporation

MOUNT VERNON, OHIO — GROVE CITY, PENNA.

New York Washington, D. C. Bradford, Pa. San Francisco Houston, Dallas, Greggton, Pampa and Odessa, Texas Seattle Tulsa Shreveport St. Louis Los Angeles Chicago Caracas, Venezuela Cooper-Bessemer of Canada, Ltd., Halifax, Nova Scotia Gloucester, Mass. New Orleans, La.



helping to generate a **power-full** "Municipal Story"

All over America powerful diesel engines are meeting the dual challenge of increasing load capacities and lowering the cost of power production for municipalities.

It is only natural that each year sees an increasing number of diesels in municipal use, for the economy of diesel operation has proved to be an important contribution toward reduced taxation and balanced city budgets.

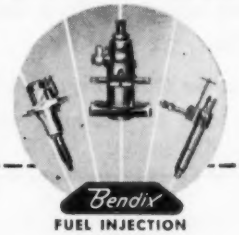
It is also significant that more and more cost-conscious municipal operators are installing diesel power plants with Bendix* Fuel Injection because Bendix is long experienced in working with diesel manufacturers in achieving maximum performance with low operating costs.

*REG. U.S. PAT. OFF.

Nordberg 800 H.P. 6-Cylinder Diesel

Baldwin 750 H.P. 6-Cylinder Diesel

Cooper-Bessemer 1500 H.P. 12-Cylinder Diesel



SCINTILLA DIVISION of Bendix
AVIATION CORPORATION
SIDNEY, NEW YORK

Western Market Office: 582 Market Street, San Francisco, Calif. • Export Sales: Bendix International Division, 72 Fifth Avenue, New York 11, N. Y.

SLASH BRAKE LINING WEAR WITH

Allison Torqmatic Brake

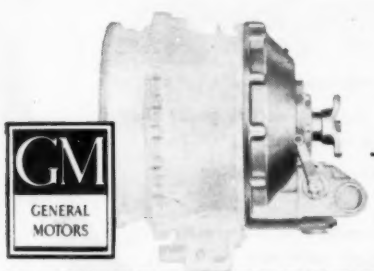
FIELD TESTS prove regular service brake linings last up to 8 times as long in trucks equipped with Allison TORQMATIC BRAKES. But increased brake lining life is only part of the story. The new TORQMATIC BRAKE also enables safer downhill hauling for heavy-duty trucks — speeds job-cycle time — boosts production — cuts maintenance costs.

On downhill hauls, the TORQMATIC BRAKE saves the regular friction brakes for complete stops or "snubbing" on curves. There are no wearing parts to burn up or wear out. Oil does all the braking work. The TORQMATIC BRAKE is installed as an integral part of the drive line in trucks equipped with Allison TORQMATIC DRIVES—uses the same oil as in the TORQMATIC Converter so there are no freezing problems in winter.

Proved in field tests

A Western contractor hauling 34-ton loads down 7% grades reports the TORQMATIC BRAKE helped increase daily round trips 50%—let him safely *triple* downhill hauling speeds — extended brake lining life 8 times.

If you're hauling on hilly, mountainous downhill runs, you can cut costs and increase production with Allison's TORQMATIC BRAKE. For full details, fill in the coupon and mail it today.



GM GENERAL MOTORS

Allison

TORQMATIC BRAKE

Newest Member of the Torqmatic Drive Line

ALLISON DIVISION OF GENERAL MOTORS
Box 894S, Indianapolis 6, Indiana

Please send me Bulletin SA 1026 with full details on the new Allison TORQMATIC BRAKE.

NAME _____

POSITION _____

COMPANY _____

ADDRESS _____

Look to COOK

COOK Piston Rings

SAVE $19,509 By Increasing Efficiency—

ADD 10 Years' Life To "Worn Out" Liners!

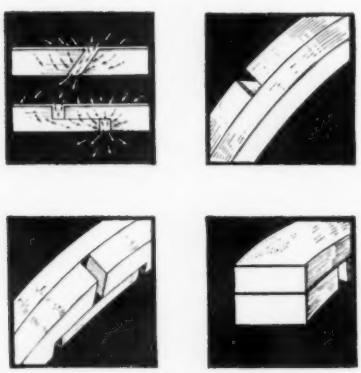
High fuel and lubricating oil consumption indicated new cylinder liners were in order for the municipality's* two 350 kw Diesels. Before making the necessary $3600 outlay, Cooktite Sealing Rings were given a trial. That was 10 years ago! Since then, the "worn out" liners and original Cook Rings have rolled up the following record on these two engines —

Total operating hours	**89,159**
Total kw generated	**22,250,000**
Average increase kwhr/gal	**.64**
Total savings (included fuel oil, lube oil and cost of replacement liners)	**$19,509.00**

Naturally, when two *new* engines were added by this power station, both were fitted with Cooktite Rings the first time pistons were pulled.

This is the kind of performance that has made "Cook" the No. 1 Piston Ring specification with scores of engine and compressor users for over 30 years. If you're looking for a seal with the savings ***built in,*** write today for product information and name of your nearby Cook representative. C. Lee Cook Mfg. Co., Inc., Louisville 3, Kentucky.

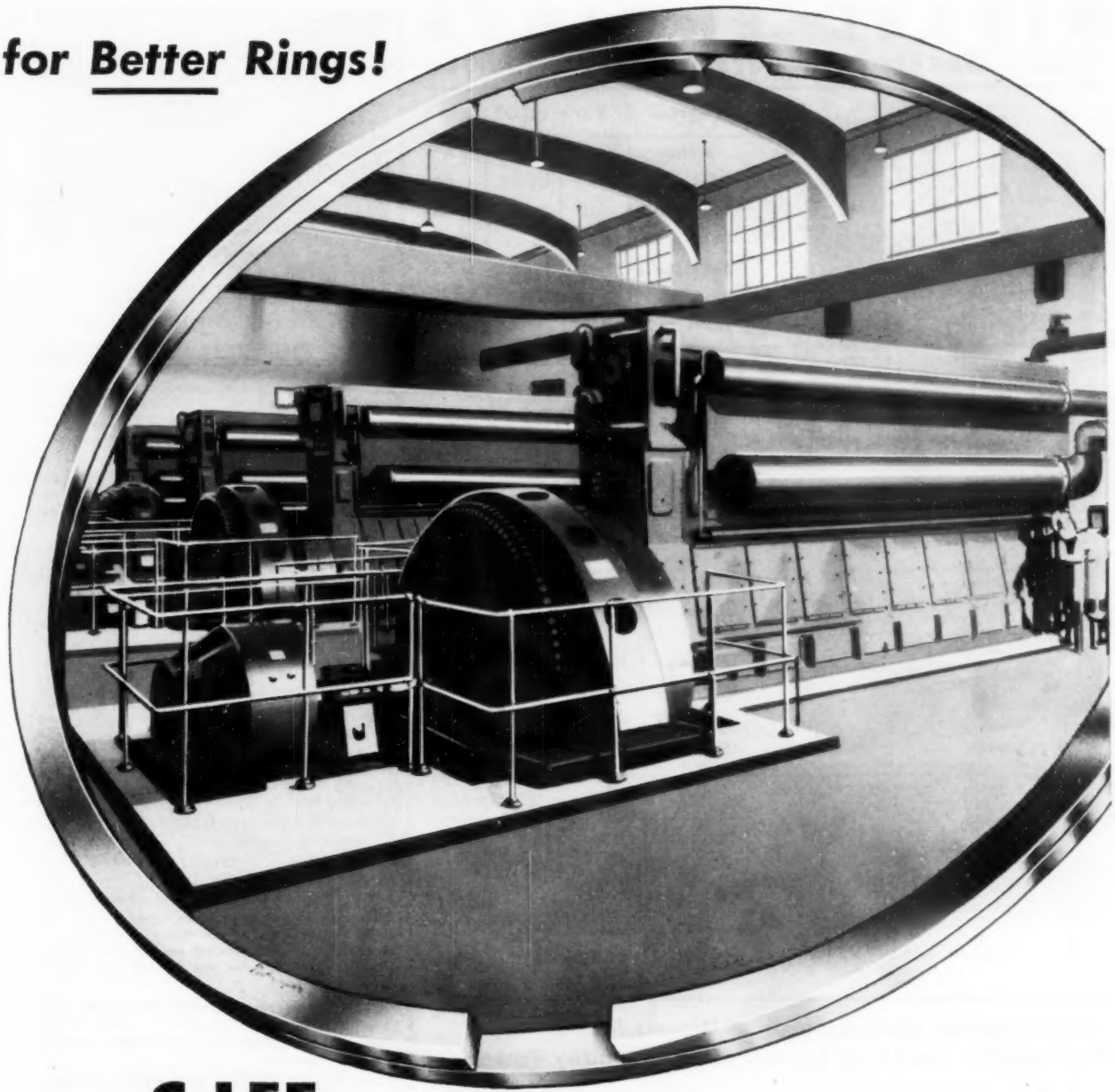
**Name of user supplied on request*



In the thumbnail sketches: **Fig. 1** illustrates how compression and firing pressures leak through the joint openings where ordinary rings are used alone, which increases rapidly with accumulated wear. **Figs. 2 and 3** show how the Cooktite gaps remain continuously sealed, even when used in worn cylinders, and after considerable ring wear has occurred. **Fig. 4** shows how full depth radial strength in both parts of the Cooktite accounts for its long life and dependability, even when used in extremely worn cylinders.

JOB-PROVEN
ADVANTAGES OF
COOKTITE RINGS
1 Eliminate blow-by in both new and worn cylinders.
2 Increase cylinder life because no hot gases blow past piston to destroy lubricant.
3 Reduce fuel consumption by eliminating compression losses.
4 Improve engine performance by maintaining equal compression in all cylinders irrespective of wear.

for Better Rings!



C. LEE COOK MANUFACTURING CO.

Sealing Pressures Since 1888

Get Facts!

C. Lee Cook Manufacturing Co. — Dept. DPO-44
916 South 8th Street, Louisville 3, Kentucky

Gentlemen: Please send me complete information on Cook Piston Rings and name of nearest representative.

Firm_____

Street_____

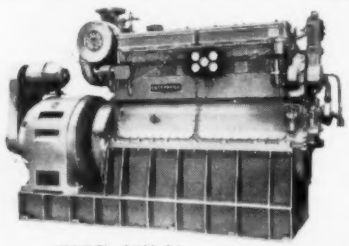
City_____ State_____

Attention:_____

Type of Units_____

DIESEL ENGINES

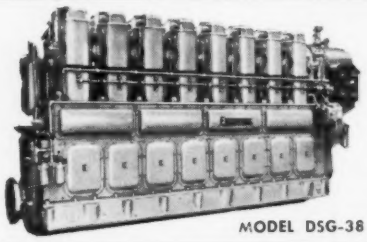
Prime Movers · Generator Sets · Marine



MODEL DSM-36

M Series 8" Bore x 10" Stroke

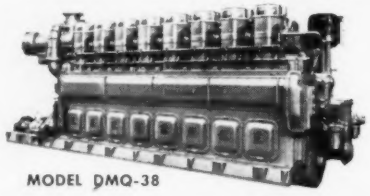
MODEL	HP	RPM	KW*
DMM-3 DSM-3	73-162	450-1000	47-108
DMM-4 DSM-4	97-216	450-1000	63-146
DMM-6 DSM-6	146-324	450-1000	98-222
DMM-36 DSM-36	274-609	450-1000	186-424
DMM-8 DSM-8	194-432	450-1000	130-298
DMM-38 DSM-38	366-812	450-1000	252-569



MODEL DSG-38

G Series 12" Bore x 15" Stroke

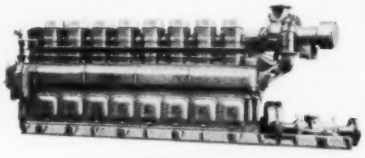
MODEL	HP	RPM	KW*
DMG-6 DSG-6	273-655	250-600	185-456
DMG-36 DSG-36	482-1157	250-600	332-811
DMG-8 DSG-8	364-874	250-600	250-612
DMG-38 DSG-38	643-1542	250-600	445-1090



MODEL DMQ-38

Q Series 16" Bore x 20" Stroke

MODEL	HP	RPM	KW*
DMQ-6 DSQ-6	647-971	250-375	450-682
DMQ-36 DSQ-36	1142-1713	250-375	801-1210
DMQ-8 DSQ-8	863-1295	250-375	605-908
DMQ-38 DSQ-38	1523-2285	250-375	1068-1624



MODEL DMR-38

R Series 17" bore x 21" Stroke

MODEL	HP	RPM	KW*
DMR-6 DSR-6	767-1151	250-375	536-806
DMR-36 DSR-36	1354-2031	250-375	952-1442
DMR-8 DSR-8	1023-1535	250-375	719-1085
DMR-38 DSR-38	1805-2708	250-375	1275-1935

*Minimum to maximum range at 50 to 60 cycle.

Specify Quality-Built Enterprise Diesels for Dependable, Low-Cost Continuous or Standby Power

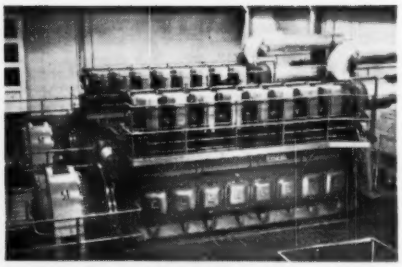
From the ENTERPRISE line of heavy-duty diesels, you can choose the correct model with highest efficiency for your particular requirements. For *municipal and industrial power generation*, select from straight diesel, Dual-Fuel Select-O-Matic®, or heavy-fuel burning types of engines. *Sewage disposal plants* can profitably employ the ENTERPRISE Spark-ignition Gas Engines, utilizing waste sewage gas as fuel. As prime movers, such as *driving petroleum pipe line pumps*, ENTERPRISE Diesel, Dual-Fuel Select-O-Matic® or spark ignition engines deliver continuous service at low horsepower cost.

In marine service, ENTERPRISE Diesels meet the most exacting requirements. Such developments as the new ENTERPRISE Single-Lever Hydraulic Control System have greatly simplified engine and boat control. ENTERPRISE Diesels may be specified for direct propulsion, diesel-electric propulsion, gear-driven propulsion in single or multiple units, and for auxiliary ship's service. Write for information and the address of our sales and service representative nearest you.

Enterprise DEPENDABLE Diesels

ENTERPRISE ENGINE & MACHINERY CO.
A Subsidiary of General Metals Corporation
18th & Florida Sts., San Francisco 10, California

Diesel Engines • Dual Fuel Engines
Oil Burners
Vertical Hammermills • Dewatering Presses



Typical municipal diesel power plant

KNOW THE EXTRA VALUES OF ENTERPRISE BEFORE YOU BUY YOUR NEXT DIESEL ENGINE

There's a lot in knowing what goes on behind the scenes that contributes to the overall *long-term value* of a product. Comparison of ratings or the exterior design of two engines may reveal only minor differences.

For a better evaluation of ENTERPRISE Diesels and service, therefore, we have set down a few of the more important considerations that you should know about these engines:

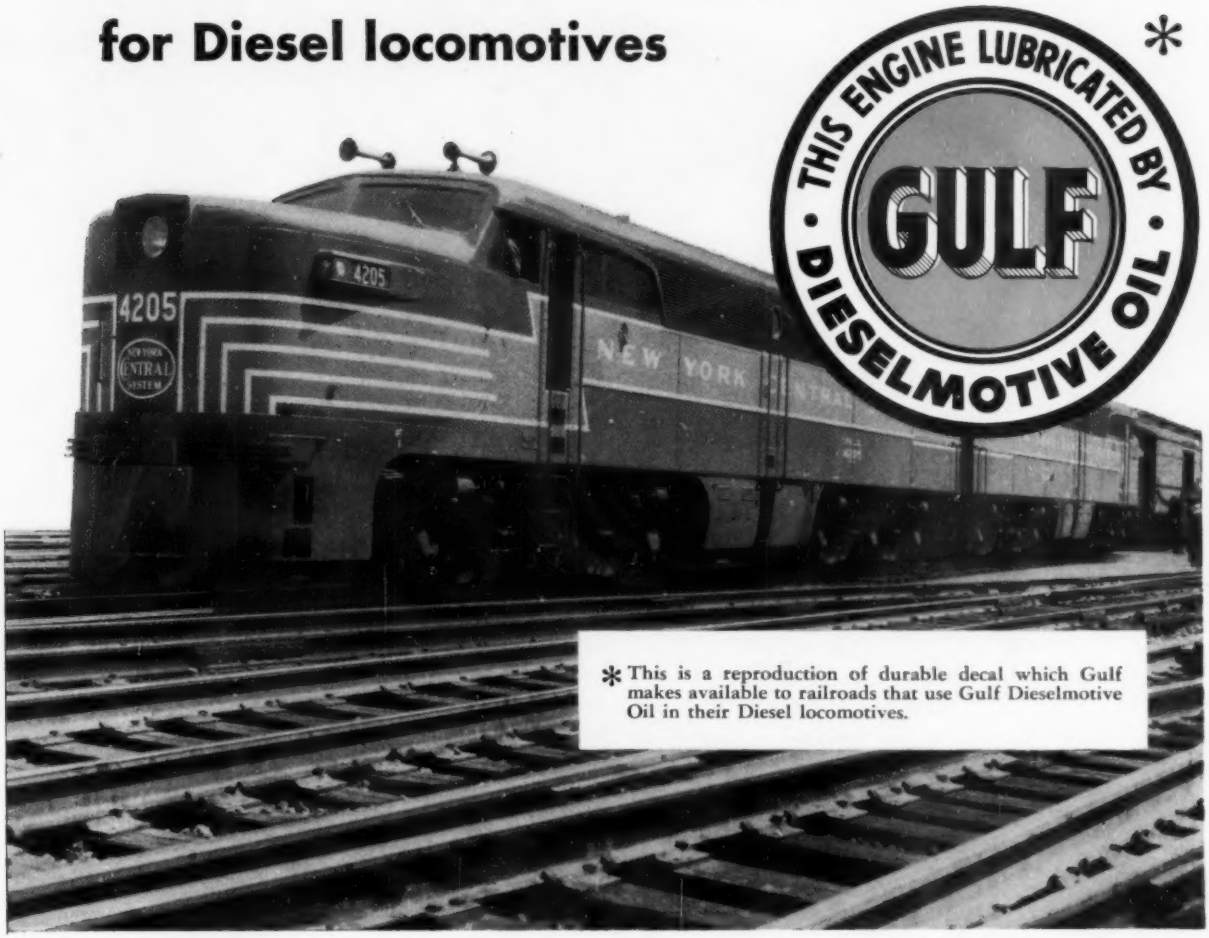
- **Every ENTERPRISE Engine** is Custom-Built — *precision*-built — to your exact power and installation requirements. Your engine is designed, built, equipped, tested and installed to do its specific job with greatest possible efficiency.
- **Conservative Ratings** assure ample power reserve for emergency or sustained overloads. There is no sacrifice in efficiency, with long, trouble-free engine life.
- **ENTERPRISE Diesel Experience** in marine and stationary power reaches through 33 years and hundreds of outstanding installations. During this period ENTERPRISE has made many valuable contributions to improved diesel design and engineering development.
- **Efficient and Dependable** for municipal and remote industrial power. Profit from this *independent* source of power — eliminate the need for high-rate purchased power.
- **A Record of Profitable Operation** in both stationary and marine power everywhere! We will be glad to refer you to ENTERPRISE customers whose experience and documented savings will clearly describe the satisfaction you too will enjoy with this equipment.
- **ENTERPRISE Service Engineers** are highly competent and thoroughly qualified to supply every phase of service required in your diesel installation and operation.
- **Immediate Availability of Parts** from factory stocks located at major ports. Shipment of repair or replacement parts on short notice by air, land or sea is handled promptly and efficiently to meet the needs of the customer.

When you inquire, you will find that power problems very similar to yours have been successfully solved with the installation of ENTERPRISE dependable Diesels. You can rely on this highly specialized experience for the best answer to your needs. Write us today for full information, stating your specific power requirements.

Typical ENTERPRISE powered craft

the sign of GOOD lubrication

for Diesel locomotives



* This is a reproduction of durable decal which Gulf makes available to railroads that use Gulf Dieselmotive Oil in their Diesel locomotives.

Here's how Gulf Dieselmotive Oil helps keep maintenance costs down, availability up:

1. Effective detergent action prevents harmful piston ring deposits.
2. Selected base stocks insure against hard deposits on the piston crown and area above first ring.
3. 100% solvent refining insures greater stability and better bearing protection.

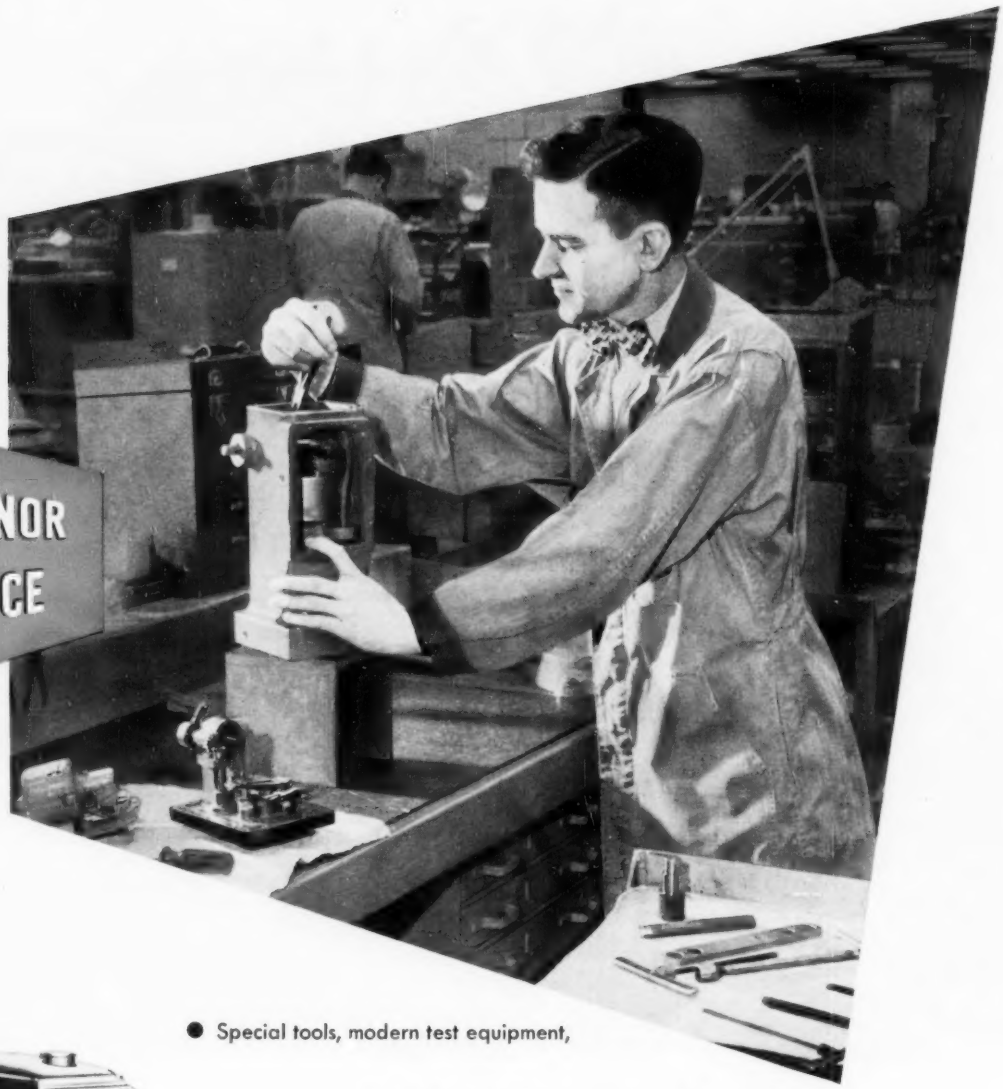
Call in a Gulf Sales Engineer and ask him to recommend the proper grade of this quality lubricant to improve lubrication and reduce maintenance costs for your Diesel locomotives. Contact him at your nearest Gulf office, today.

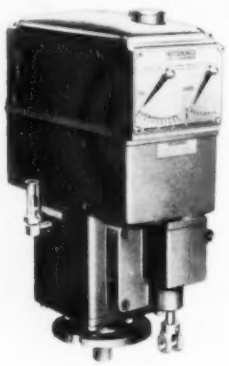
GULF OIL CORPORATION • GULF REFINING COMPANY

1822 GULF BUILDING, PITTSBURGH 30, PENNSYLVANIA

GULF

GOVERNOR SERVICE





● Special tools, modern test equipment, and skilled mechanics are necessary for satisfactory repair of sensitive governor mechanisms. Our properly equipped service shop can supply you with a like new rebuilt governor on an exchange basis. Send us the serial number of your equipment for quick service.

WOODWARD GOVERNOR COMPANY

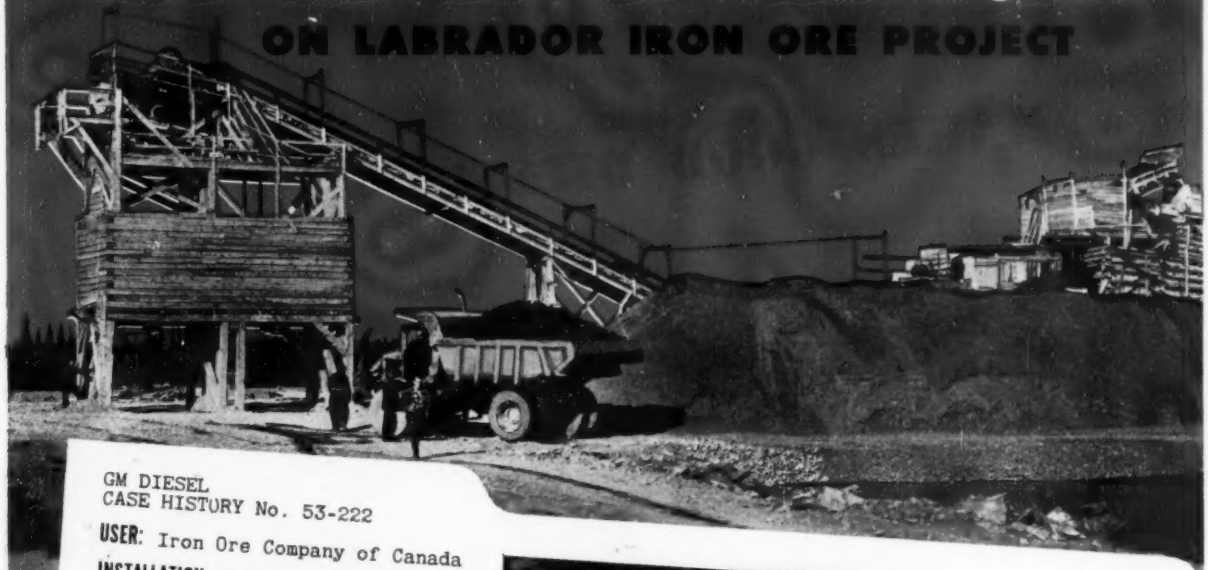
ROCKFORD, ILLINOIS

84 YEARS WOODWARD SERVICE

World's oldest and largest manufacturer of hydraulic governors for prime movers

More than 200 GM Diesel Engines

ON LABRADOR IRON ORE PROJECT

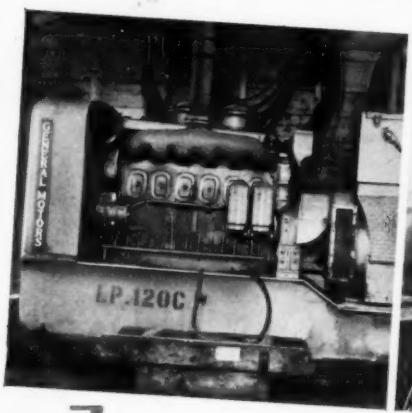


GM DIESEL
CASE HISTORY No. 53-222

USER: Iron Ore Company of Canada

INSTALLATION: GM 6-71 powering conveyors and washer. Another GM 6-71 drives Holland hammer mill. Crusher supplies material for Menihek Dam project, 300 miles above base camp. Two of more than 200 GM Diesels used by I.O.C. and contractors in a wide variety of equipment.

PERFORMANCE: Crusher produces up to 500 yards per day, depending upon truck availability. Crushing 12" stone to 1" to 5" sizes; fines used as sand. GM Diesel used previously for lighting at base camp had run 18,000 hours without any downtime.



—and this one worked 18,000 hours without overhaul

Pushing a railroad 360 miles through wilderness to tap rich iron deposits on the remote Quebec-Labrador border, the Iron Ore Company of Canada and contractors building the road, dams and terminal facilities depend upon General Motors 2-cycle Diesel engines for more different kinds of work than any other engine.

Among the many good reasons is GM Diesel's dependable 2-cycle operation which means more power from a smaller, more compact engine. Smoother, quicker-acting faster-starting power that corresponds to increased loads and gets work done faster at lower cost.

Also, in isolated operations like this—where fuel and all supplies had to be flown in—lighter weight and interchangeability of GM Diesel parts insure higher availability and cut costs. Most moving parts are identical for all Series 71 engines—2 to 24 cylinders—so parts cost less and inventory requirements are lower. Users need never worry about replacements or service, for GM Diesel engines and parts are sold through a world-wide organization of distributors and dealers. The one near you will welcome your inquiry on any power problem.

DETROIT DIESEL ENGINE DIVISION
GENERAL MOTORS • DETROIT 28, MICHIGAN
Single Engines . . . 16 to 275 H.P. Multiple Units . . . Up to 840 H.P.

It pays to STANDARDIZE on

GM
GENERAL MOTORS
DIESEL
POWER

. . . available in more than 750 models of equipment built by over 150 manufacturers

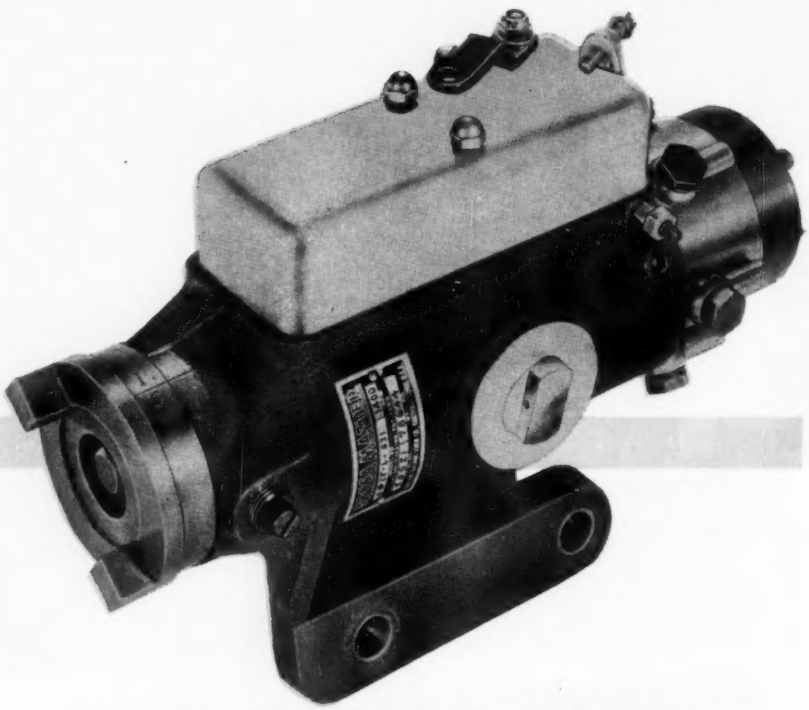
ROOSA MASTER

THE MODERN FUEL INJECTION PUMP

MAKES GOOD DIESELS BETTER

GENERAL FEATURES

- PERFORMANCE-PROVEN LIFE
- SMALL, COMPACT, LIGHTWEIGHT
- EASY TO SERVICE
- LOW MAINTENANCE COST
- EASY TO INSTALL
- OPERATES IN ANY POSITION
- EXTREMELY CLOSE SPEED REGULATION
- SMOOTH PERFORMANCE AT LOW IDLING SPEEDS



CONSTRUCTION FEATURES

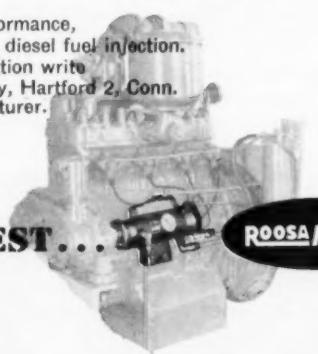
- SINGLE ADJUSTMENT REQUIRED
- BUILT-IN GOVERNOR AND TRANSFER PUMP
- COMPLETELY SELF-LUBRICATING, OIL FILLED
- CALIBRATION INHERENT IN DESIGN
- NO POPPET VALVES
- NO COMPLICATED SPRINGS
- NO GEARS • NO BALL BEARINGS
- NO ROTATING, SPRING-LOADED, LAPPED SURFACES.

A revolutionary contribution to better and simplified diesel fuel injection, Roosa Master offers to both diesel engine manufacturers and users advanced features found in no other fuel injection pump.

Roosa Master, perfected after 15 years of engineering and research, is designed for use with all major types of high speed diesel engines . . . interchangeable with most existing fuel injection equipment.

Roosa Master is manufactured by Hartford Machine Screw Company, one of New England's leading manufacturers of precision machined products, and backed by a 75-year-old tradition of integrity and dependable customer service.

For the best in diesel engine performance, specify Roosa Master, the best in diesel fuel injection. For literature and further information write Hartford Machine Screw Company, Hartford 2, Conn. or consult your engine manufacturer.

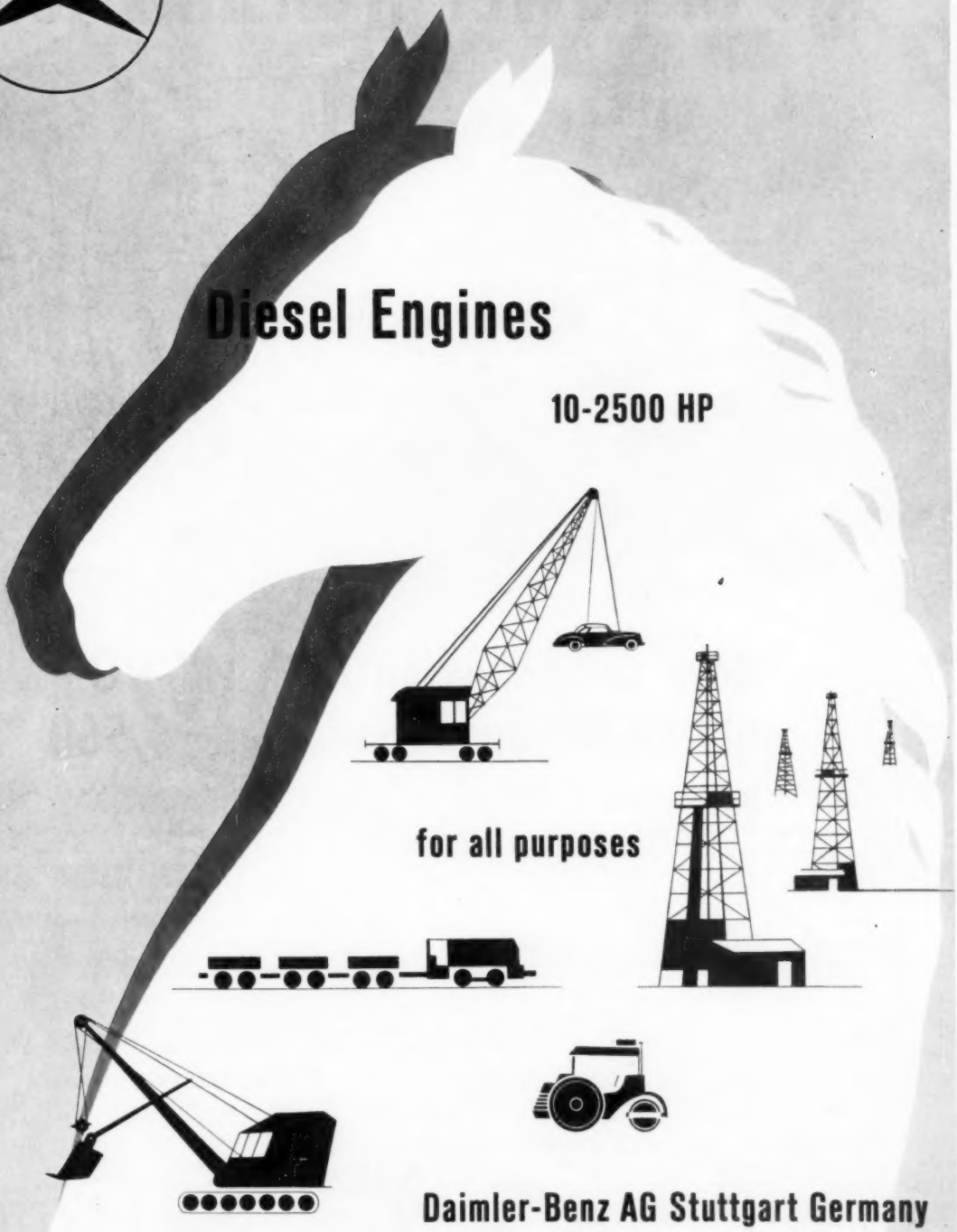


DIESEL FUEL INJECTION AT ITS VERY BEST... ROOSA MASTER

MERCEDES-BENZ

Diesel Engines

10-2500 HP



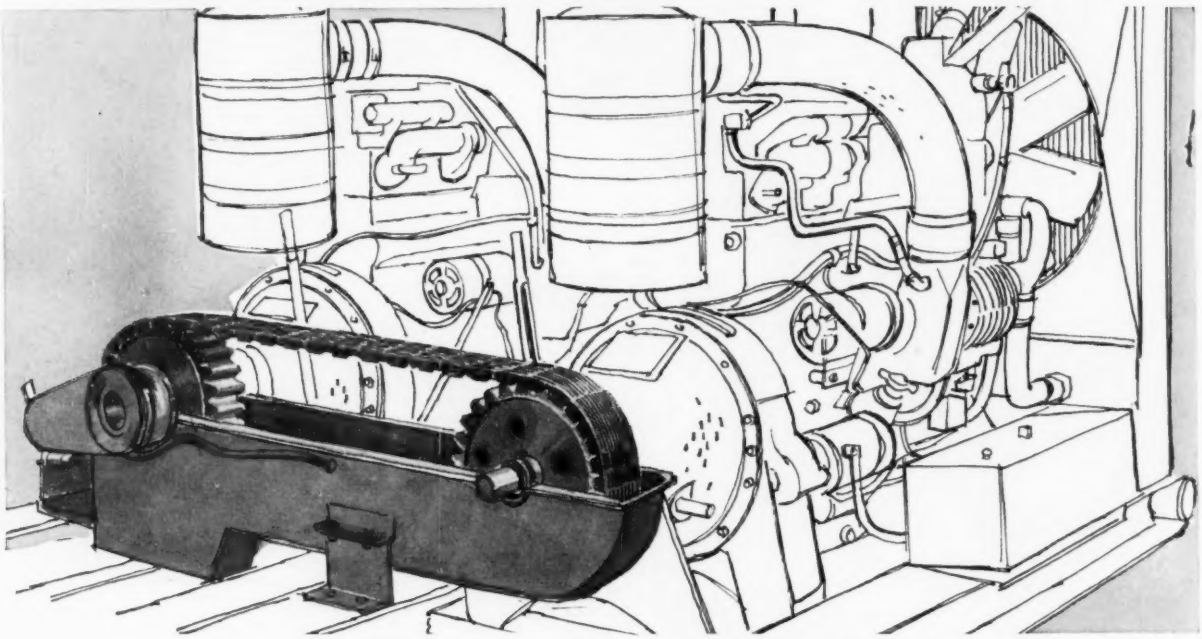
for all purposes

Daimler-Benz AG Stuttgart Germany

Eastern States
EUROPA MOTORS, INC.
991 Sixth Avenue
New York 18, N. Y.

Pacific Coast
INTERNATIONAL MOTORS INC.
5670 Sunset Boulevard
Hollywood 28, Calif.

Morse HY-VO DRIVE for a new age in power transmission!



How compounding with HY-VO could save you as much as $4,560

Now, gain new advantages in buying and compounding smaller, higher speed engines with Morse Hy-Vo Drive.

You make major cost savings.

The total cost of two high-speed engines and the Hy-Vo Drives with which they are compounded will usually be considerably less than a single large engine of equivalent horsepower. A brief look at some figures will show how this works . . .

For example, if you needed 250 continuous horsepower at 1200 rpm., you could: 1) Buy a manufacturer's 250 hp., 1200 rpm. engine, which lists for $13,380; 2) buy the 250 hp., 1800 rpm. engine for $11,930 (using Hy-Vo as a connection and reduction drive, also eliminates the costly flexible coupling normally required in choice No. 1); 3) or, use two 130 hp., 1800 rpm. engines, listing for a total of $8,820, and use Hy-Vo as your compounding drive.

With the 250 hp., 1800 rpm. engine, you save $1,450, more than enough to pay for your Hy-Vo Drive. Compounding two 130 hp., 1800 rpm. engines, you save $4,560 over base list cost of the 250 hp., 1200 rpm. engine.

From this saving you could pay for your Hy-Vo Drive and bank several thousand dollars. In most cases, too, Hy-Vo will be so narrow it will eliminate costs of outboard bearings and mountings, with the bonus that single-engine operation is possible under reduced power requirement.

Other power transmission methods generally have either inherent restrictions on rotative speeds and velocities that limit 200 hp. or larger engines to 1200 rpm., or are too costly. Hy-Vo has far greater upper limits, with relatively lower cost.

Because of exceptional rotative speeds and velocities, Hy-Vo brings you comparable savings in electric motors, too. Write us for details on compounding with Morse Hy-Vo Drive.

MORSE CHAIN COMPANY

7601 Central Ave. • Detroit 10, Michigan

SOME DESIGN FACTORS BEHIND HY-VO'S SUCCESS . . .

Hy-Vo's many design and manufacturing refinements result in a drive with unusual power transmitting capacity. Note involute tooth design of Hy-Vo Sprockets . . .

. . . and the new, Hy-Vo Compensating Rolling Joint, which always shifts the pitch line automatically as the Hy-Vo Chain engages the involute teeth of the sprocket.

Chain follows a path truly tangent to sprocket pitch circle, virtually eliminating chordal action. A new, balanced link design greatly improves stress distribution.

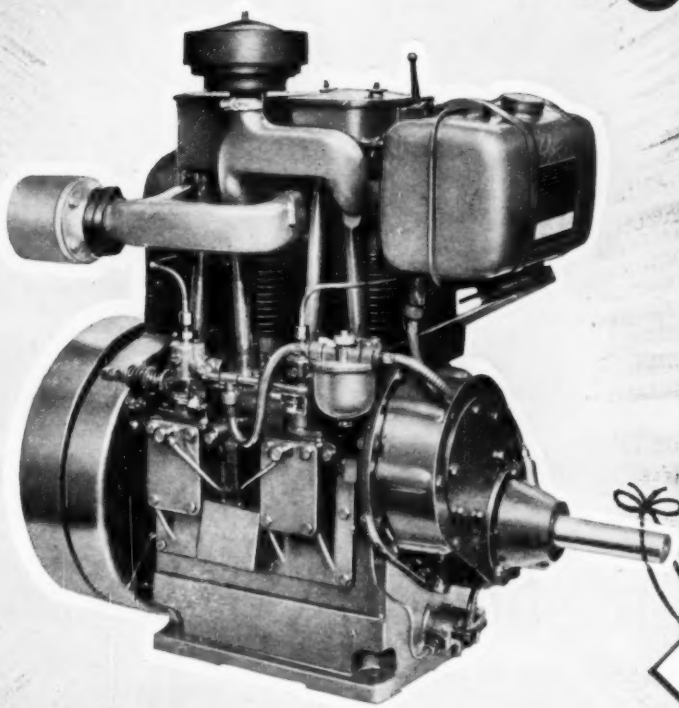
MORSE

MECHANICAL POWER TRANSMISSION PRODUCTS

Petter

Diesel Engines

AIR-COOLED
WATER-COOLED
3 H.P. TO 40 H.P.



LOW COST

BACKED BY A WORLD-WIDE
PARTS AND SERVICE ORGANISATION
FOR THE 350,000 ENGINES IN USE

- MARINE AUXILIARIES
- GENERATORS
- PUMPING EQUIPMENT
- COMPRESSORS
- REFRIGERATION
- OIL FIELD EQUIPMENT
- MINING EQUIPMENT
- AGRICULTURE MACHINERY

WRITE FOR INFORMATION

A FEW CHOICE DISTRIBUTORSHIPS OPEN

PETTER

ENGINE DIVISION OF **BRUSH ABOE** INC.

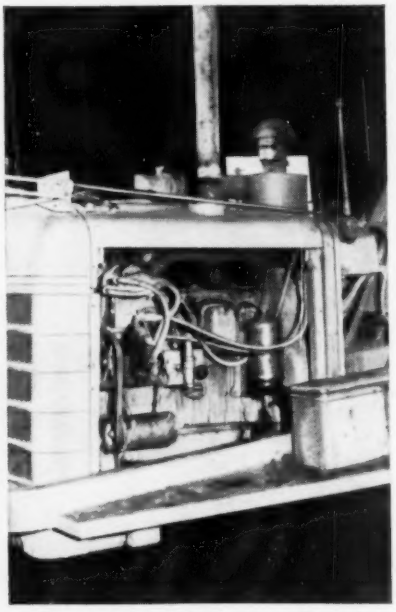
Office and Showroom 60-07 39th AVE. WOODSIDE, NEW YORK

The Engineer's Report

CASE HISTORY

LUBRICANT RPM Delo Oils

FIRM Dana Company, Inc., Apple Valley, Calif.



This paving machine diesel worked more than 2400 hours, laid 85 miles of asphalt highway before even the head was removed.

No bearing, ring trouble in 6 years desert operation!

Sand, wind, dust and heat are tough on engines in the California desert where Dana Company, Inc., develops subdivisions, builds and paves streets and highways. But, using RPM DELO Lubricating Oils, not one engine lost a bearing or stuck a ring in 6 years. Even with constant dust conditions and rapid temperature changes—often from below freezing to 75°F. in a morning—they have no carbon and sludge problem. "RPM DELO Oils keep our engines very clean and cut repair costs," says Mr. Ross Dana, President. "One diesel in a paving machine laid 85 miles of asphalt, worked 2400 hours before it was touched. Then, only a valve grind was needed."

FREE FOLDER tells you about all the RPM DELO Oils and how they meet every heavy-duty engine condition. Write or ask for it today.

FOR MORE INFORMATION about petroleum products of any kind or the name of your distributor, write or call any of the companies listed below.

RPM DELO LUBRICATING OILS

TRADEMARK "RPM DELO" REG. U.S. PAT. OFF.

How RPM DELO Oils reduce wear, corrosion, oxidation in all Heavy-Duty Engines

A. Contain special additives that provide metal-adhesion qualities...protect parts whether hot or cold, running or idle.

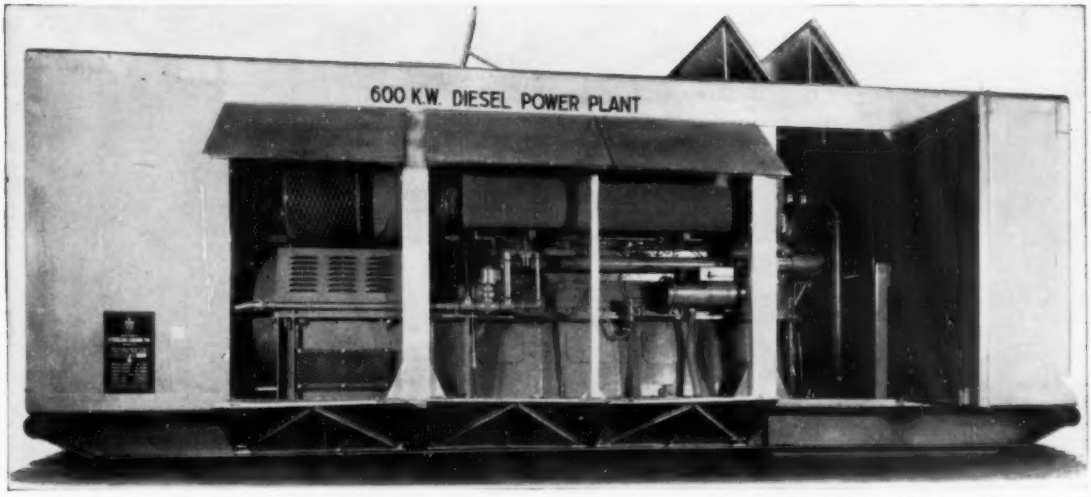
B. Anti-oxidant resists deterioration of oil and formation of lacquer...prevents ring-sticking. Detergent keeps parts clean...helps prevent piston scuffing.

C. Special compounds stop corrosion of any bearing metal and foaming in crankcase.

STANDARD OIL COMPANY OF CALIFORNIA, San Francisco 20 • STANDARD OIL COMPANY OF TEXAS, El Paso
THE CALIFORNIA OIL COMPANY, Barber, New Jersey • THE CALIFORNIA COMPANY, Denver 1, Colorado

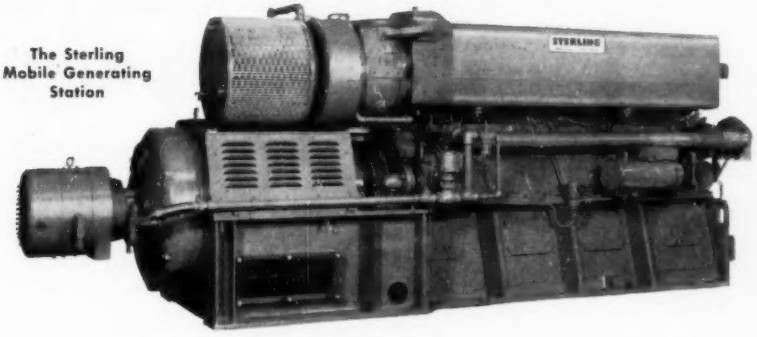
● **An unprecedented power plant that moves on wheels ... that's ready for instant use ... ANYWHERE**

Ever see 600 KW going places along the highway?



(ABOVE) Right side view of the mobile generating plant resting on the ground in full operation. Integral jacks quickly load or unload the plant from trailer. The welded steel base provides storage space for fuel and lubricants. No foundation is required.

The Sterling Mobile Generating Station



(LEFT) Heart of the mobile plant is this powerful engine-generator set showing the Sterling diesel, the direct coupled main generator, the exciter and the turbo-supercharger. This set develops 600 KW of continuous useful power to the bus...can operate at 10% overload for periods up to 2 hours in ambient temperatures ranging from 0°F to 125°F.

The Sterling 600 KW Mobile Generating Station introduces a new concept in electric power supply. It is a completely self-contained plant that moves on wheels ...or by rail or water. It is fully equipped for independent operation...has its own integral foundation and weather-resistant housing...stores its own fuel and lubricants...has its own separate lighting and heating systems. The mobile station, singly or in parallel, supplies abundant power where you need it...when you need it... as long as you need it!

Many public utilities, private businesses, service organizations and governmental bodies are investigating the potential for this type of plant in their operations. Some plants are already in service. We'll be glad to assist in an application study. Write or call us. Send for descriptive brochure.

Picture your own applications for this unusual power station:

1. As a ready source of power at an out-of-way location...a new mine, construction project, oil field, etc.
2. To help handle seasonal or temporary peak loads at outlying points in a transmission system.
3. To introduce power in an area pending the design and construction of a permanent transmission line.
4. For emergency standby service anywhere.
5. For rapid transit to any locality hit by hurricane, tornado, flood, explosion or other disaster.

Sterling — THE MOST ADVANCED IN ENGINEERING

Mobile Power Plants from 250 KW to 1000 KW

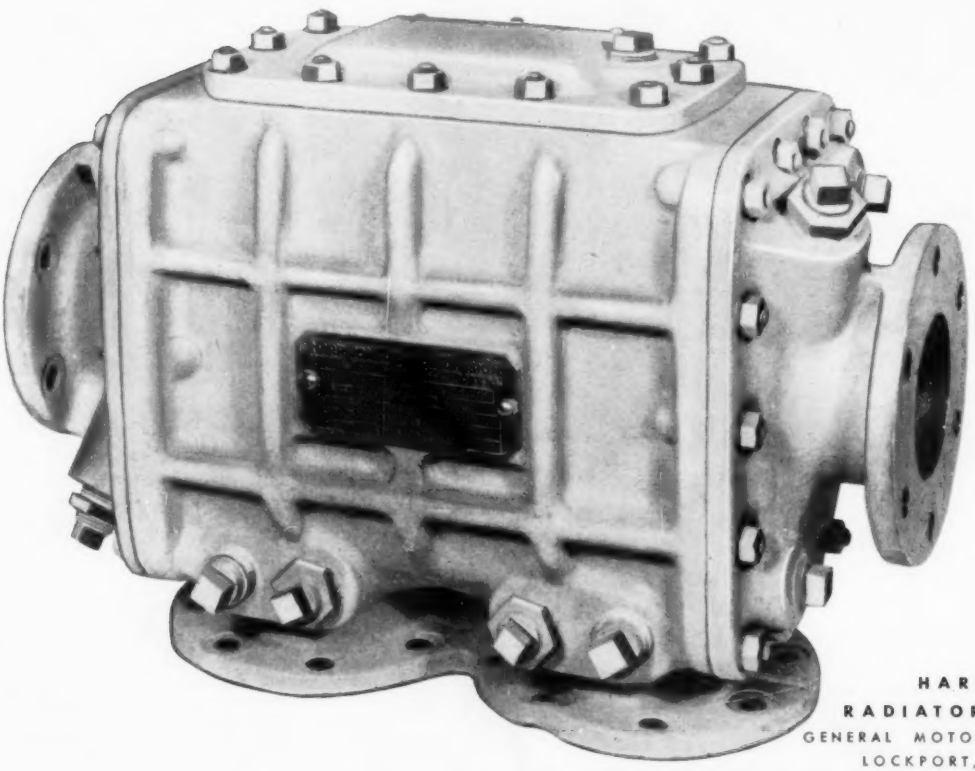
STERLING ENGINE COMPANY

1270 Niagara Street Buffalo 13, New York

Dependable Heat Exchangers For Diesel Duty

Harrison heat exchangers have the capacity, compactness and durability that manufacturers of Diesel engines demand. They effectively control jacket water and lubrication oil temperatures for efficient, dependable Diesel engine operation.

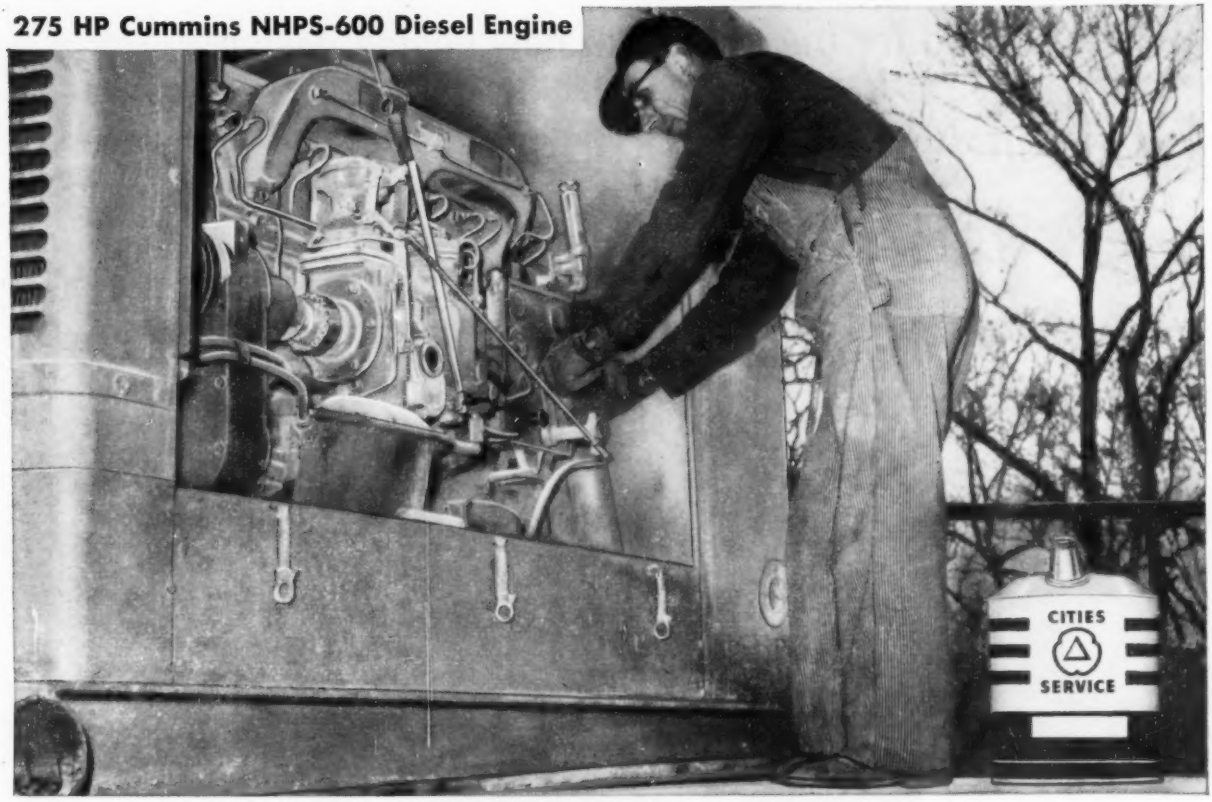
Because we have been building heat exchangers for numerous applications for the past 43 years, we have developed broad engineering know-how and unsurpassed manufacturing and test facilities. We are sure that we can help you with your heat transfer problems.



HARRISON
RADIATOR DIVISION
GENERAL MOTORS CORPORATION
LOCKPORT, NEW YORK

HARRISON

275 HP Cummins NHPS-600 Diesel Engine



6 YEARS OLD...ORIGINAL RINGS, BEARINGS USING CITIES SERVICE DC-300 DIESEL OIL

Portable Lime Pulverizer of C. B. Seamans Chalks Up Phenomenal Performance Record

Credit C. B. Seamans of Reedsburg, Wisconsin, with a remarkable invention—a portable lime pulverizing plant which completes the cycle from crusher to storage bin under control of one operator! And credit Cities Service DC-300 Diesel Oil for the remarkable maintenance record of this unique machine. From the beginning, only DC-300 oil was used to lubricate the pulverizer's powerful 275 HP Cummins NHPS-600 Diesel engine. After three years' operation, wear on the connecting rod bearings checked out at .0005". No bearings or rings were replaced, and the engine has now completed its sixth year of service.

Cities Service lubricants can help assure outstanding performance for your stationary or mobile diesels, too. For details, contact your nearest Cities Service representative or write Cities Service Oil Company, Sixty Wall Tower, New York 5, N.Y.

FROM CRUSHER TO STORAGE BIN—A ONE MAN OPERATION. C. B. Seamans' unique lime pulverizer is a portable, diesel-powered machine that requires only one operator to regulate process which completes entire cycle from crusher to storage bin. Lubricated by Cities Service DC-300 Diesel Oil, the machine has been operating for six years on original rings and bearings!

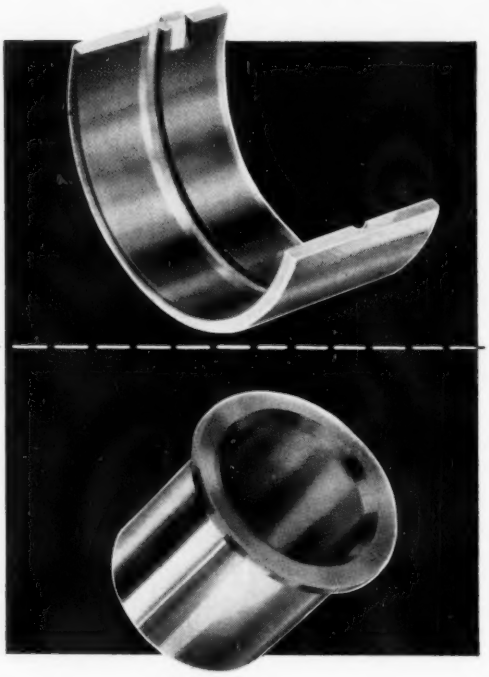
CITIES SERVICE
QUALITY PETROLEUM PRODUCTS

The standard for the leaders in new engine design

Detroit Aluminum and Brass

COPPER LEAD*

engine bearings



Detroit Aluminum & Brass is your dependable source for high duty, aircraft quality, copper lead bearings and sintered copper lead bearings. They are produced with the same high degree of accuracy and precision as the engine bearings of all types we have been supplying to the leaders in the industry since 1925.

*Copper lead bearings are lead-tin overplated to customer's specifications.

Tell our engineers about your requirements. Write...

Detroit Aluminum and Brass Corporation

DETROIT 11, MICHIGAN

***Plants at* Detroit, Michigan and Bellefontaine, Ohio**

HENSCHEL

KASSEL

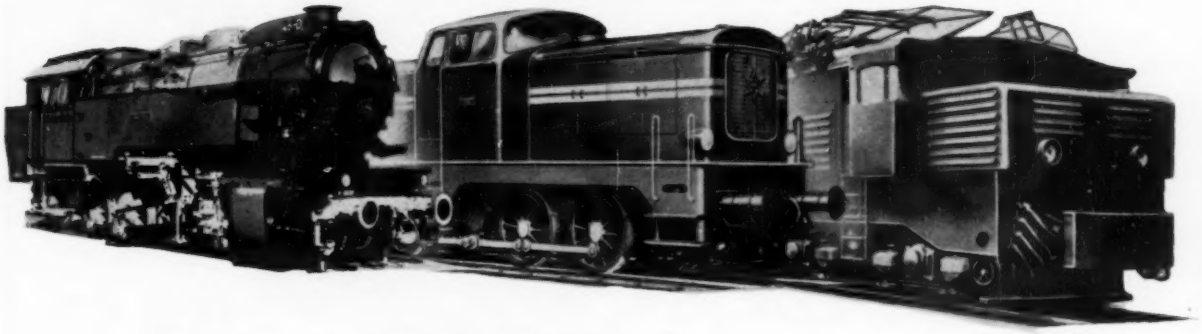
HAMBURG

exhibit at the

INDUSTRIAL FAIR HANNOVER

from April 25th – May 4th, 1954

in Open Area Block D Stand 406/409



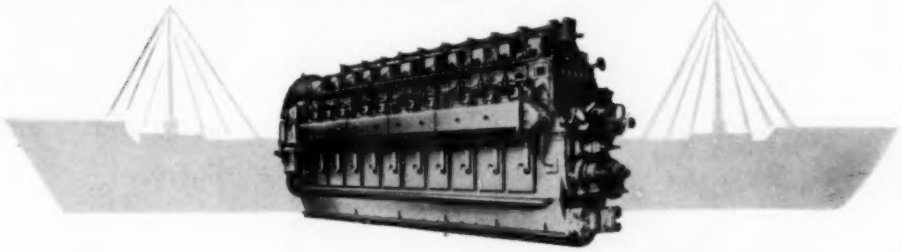
Steam-, Diesel- and Electrical Locomotives for line service, shunting service and for open cast mining

Road Rollers

Conversion Engines for Vehicles for Rail and Road

Diesel Engines for Stationary Plants

DIESEL ENGINES FOR SHIPS



Processing equipment for Tropical Plants

in Hall 2 - Stand 301

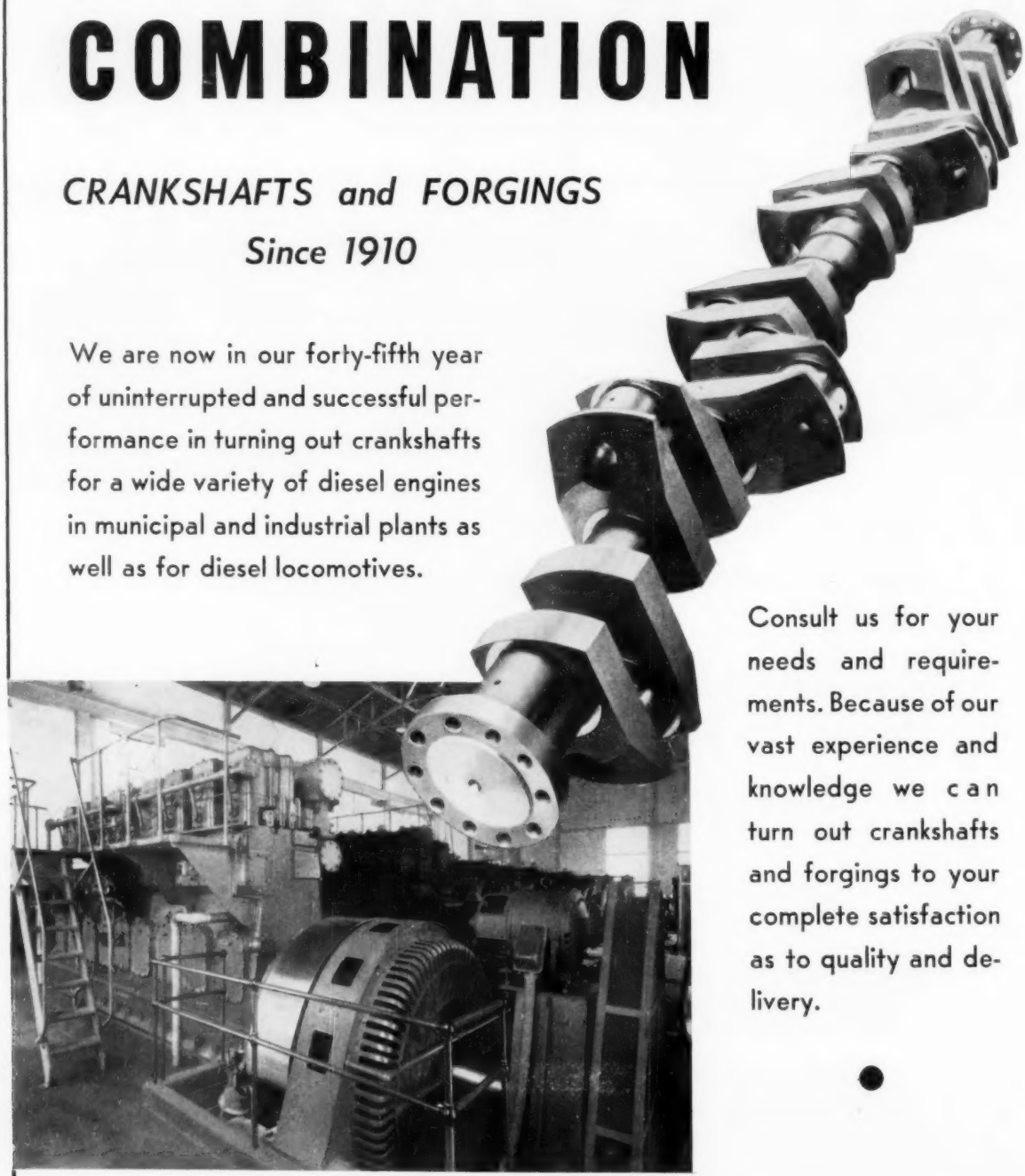
Manufacture of Gears and Toothed Wheels

HENSCHEL & SOHN GMBH KASSEL · HENSCHEL MASCHINENBAU GMBH HAMBURG

A SUCCESSFUL COMBINATION

CRANKSHAFTS and FORGINGS
Since 1910

We are now in our forty-fifth year of uninterrupted and successful performance in turning out crankshafts for a wide variety of diesel engines in municipal and industrial plants as well as for diesel locomotives.

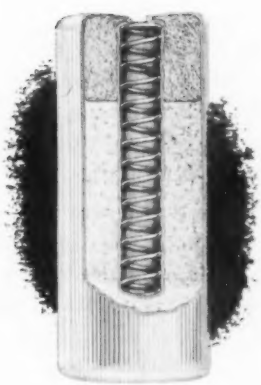


Consult us for your needs and requirements. Because of our vast experience and knowledge we can turn out crankshafts and forgings to your complete satisfaction as to quality and delivery.

ELLWOOD CITY FORGE COMPANY
CRANKSHAFTS • CONNECTING RODS • MACHINE FORGINGS
ELLWOOD CITY, PENNA.

PROTECTED

right from the start



Starting time is toughest for engines, too. That's when they really need protection. When the lube oil is cold and viscous many filters won't accept it . . . send it through the by-pass without any filtration. Then, if the oil has been contaminated, or any part of the engine fails, there is no protection for critical surfaces. The power plant goes down . . . and repair costs go up.

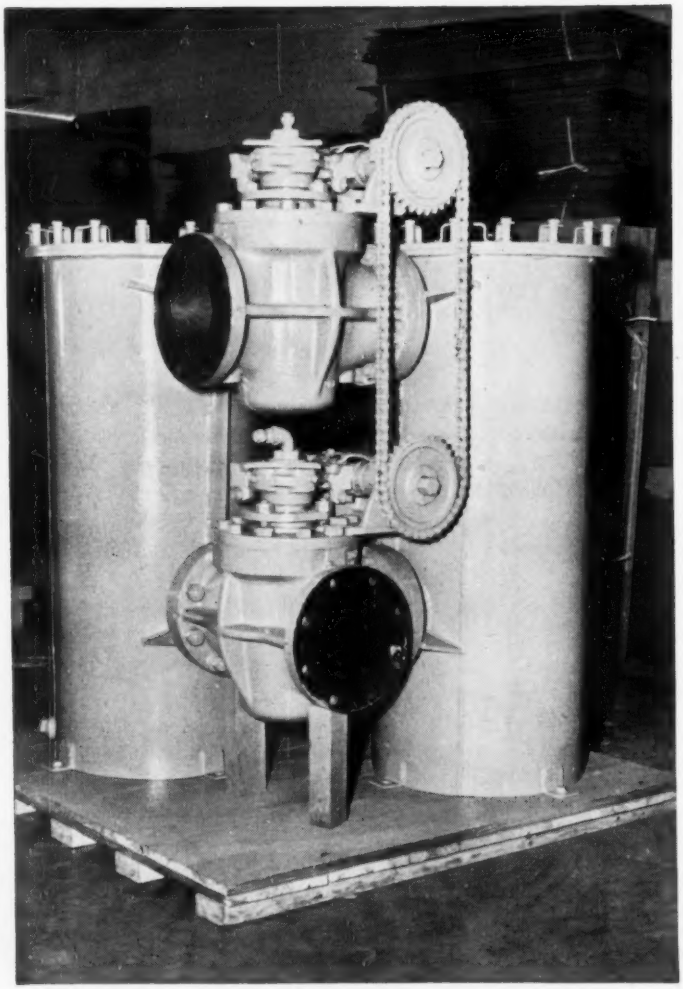
You can use Winslow full-flow filters with complete assurance that oil will be filtered . . . Hot or Cold . . . right from the start. Winslow's exclusive CP* design provides automatic pressure regulation within the element, so that oil is by-passed only under emergency conditions. CP construction gives greater porosity near the outer edge, so that large particles are trapped first. Smaller contaminants are removed as the oil passes through denser filtering media near the center. This progressive filtration is clearly superior to any element that traps all sizes of particles on the outer surface, which becomes clogged and reduces the capacity of the filter.

**CP is the title of a helpful and informative booklet available from Winslow Engineering Company. Why not write today for your copy?*

WINSLOW FILTERS

Winslow Engineering Company 4069 Hollis Street • Oakland 8, California

NEW! AIR-MAZE DUPLEX LUBE OIL FILTERS FOR LARGE MARINE AND STATIONARY DIESELS!



THIS new Air-Maze lube oil filter for *large* marine and stationary diesels stops damaging particles as small as .0032", handles 360 gpm. at normal lube pressures up to 100 psi. It readily met the exacting requirements of a large insurance company.

The new duplex filter stays on the job even if one of the filters has to be serviced. Here's how: two individual filters are connected by a chain linkage so that when one valve is closed, the other one is automatically opened. Since both filters can't be shut off at the same time, there's no danger of close tolerance parts burning out due to lack of lubrication.

This model filters at high flows by using multiple cartridge assemblies, providing an exceptionally large filtering area. Drain plugs near the bottom of the filter shell easily drain off sludge contaminate.

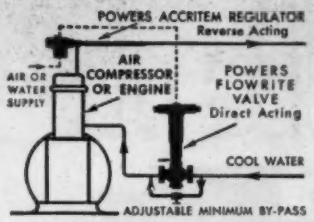
With a background of twenty-nine years experience and thousands of applications, Air-Maze, the filter engineers, have met practically every diesel filtration and silencing need. Air-Maze serves the industry with a complete line of intake silencers, oil-bath filters, lube oil strainers, fuel filters and other products. For help with your filter problems, contact your nearby Air-Maze representative or write The Air-Maze Corporation, Cleveland 28, Ohio.

The biggest names in diesels are protected by Air-Maze filters

AIR FILTERS
SILENCERS
SPARK ARRESTERS

AIR-MAZE
The Filter Engineers

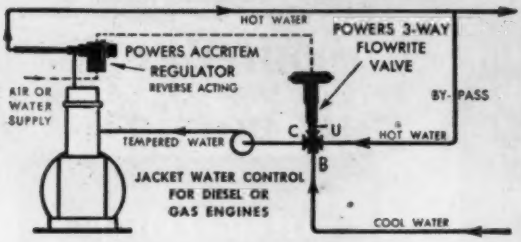
LIQUID FILTERS
OIL SEPARATORS
GREASE FILTERS



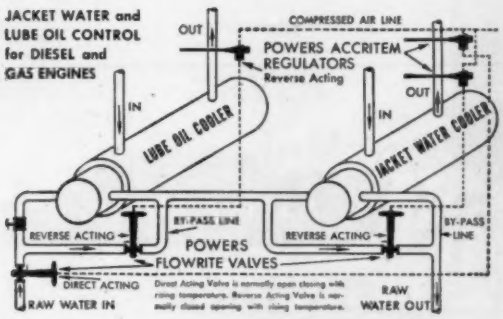
POWERS

ACCRITEM REGULATOR

Unsurpassed for reliability and power to operate large or small size 3-way or 2-way diaphragm valves for accurate control of jacket water and lube oil cooling temperatures.



Only a few of many applications are shown here.



Gives
Accurate, Low Cost Heat Control

Use Accritem Regulators to control diaphragm operated valves or dampers. They save labor, stop losses caused by over-heating and have the following—

IMPORTANT ADVANTAGES

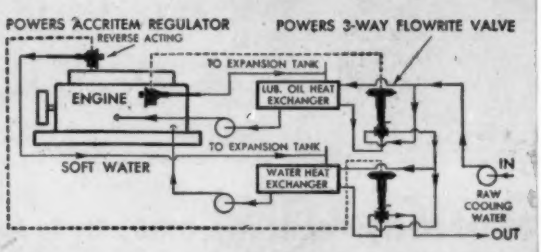
- ***Adjustable Sensitivity*** and over-heat protection.
- ***Calibrated Dial*** temperature adjustment.
- ***Simple, Rugged Construction*** withstands vibration and insures many years of reliable service.
- ***Temperature Ranges*** 50 to 250° F. and 150 to 350° F.
- ***Easy to Install*** Requires 15 lb. supply of compressed air or water for its operation.
- ***Small Size***—regulator head is only 2⅞" x 3⅝", sensitive bulb is 12" long with ½" I.P.S. connection.

Proper Cooling Temperatures assured by Powers Accritem Regulators

• Makes ignition easier • Prevents rapid breakdown of lube oil • Decreases cylinder and piston ring wear • Reduces danger of piston seizure • Lowers fuel and lube oil consumption

POWERS

FLOWRITE and METAFLOW Diaphragm Valves controlled by a POWERS ACCRITEM HEAT REGULATOR provide an unbeatable combination for *better control and lower maintenance*



Write for Bulletin 316—or phone our nearest office for prices and further information about POWERS ACCRITEM regulators and diaphragm valves.

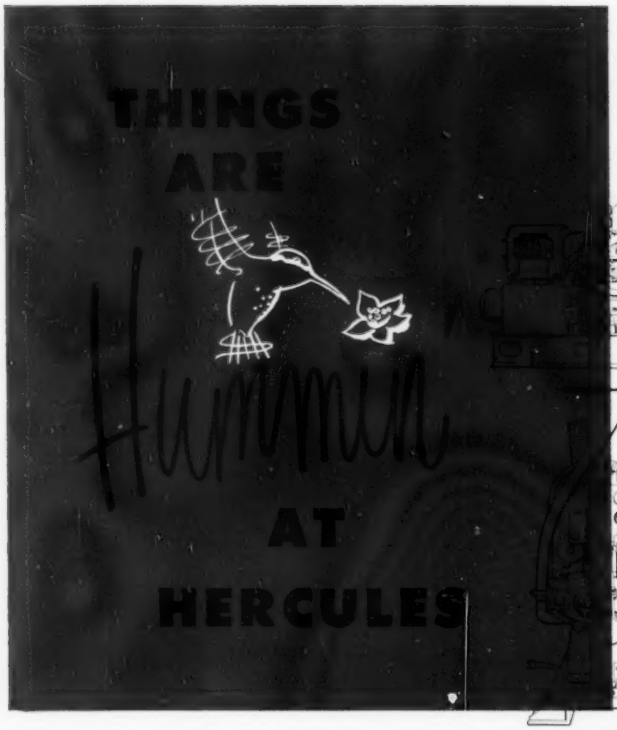
THE POWERS REGULATOR CO.

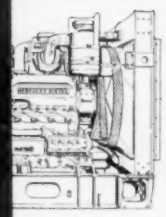
SKOKIE, ILL. • OFFICES IN OVER 50 CITIES • See Your Phone Book

CHICAGO 13, ILL., 3819 N. Ashland Ave. • NEW YORK 17, N.Y., 231 E. 46th St.
LOS ANGELES 5, CAL., 1808 West 8th St. • TORONTO, ONT., 195 Spadina Ave.
MEXICO, D. F., Apartado 63 Bis.

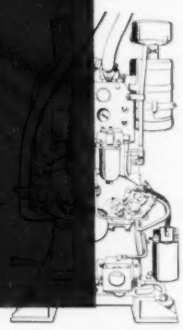
AMD

60 Years of Temperature and Humidity Control

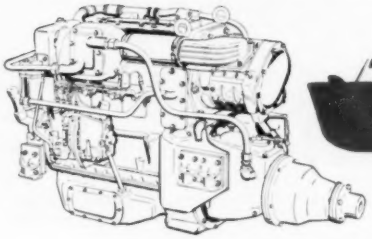




COMMUNICATIONS



REFRIGERATION



MARINE DIESELS

Yes, things are really hummin' at Hercules Motors Corporation. New applications in many fields are being completed at a rapid rate.

In the communications field, for example, the Hercules Model DNX-V8DTS eight cylinder diesel engine has been adapted for stand-by generator sets in central telephone exchanges.
In the refrigeration field, for instance, the Hercules Model DJXH six cylinder diesel engine is being used by a large railroad to refrigerate frozen foods from the west coast, overland, to eastern markets. Then too, the new Hercules Marine Diesel Engines are now being introduced in the marine field. Their lightweight, high-speed, heavy-duty design has created a very favorable response from marine operators in work boats and pleasure craft.
Plan tomorrow's power requirements today! Hercules engineers stand ready to assist you . . . and, of course, there is no obligation.

ENGINE SPECIFICATIONS

Models	Bore & Stroke	Cu. In. Displ.
2 CYLINDER		
DIX-83	3 5/16" x 4"	83
DIXC	4" x 4 1/2"	113.1
DIXD	4 1/4" x 4 1/2"	127.5
4 CYLINDER		
DIX4B	3 1/4" x 4"	133
DIX4D	3 3/4" x 4"	166
DOOB	3 3/4" x 4 1/2"	198.8
DOOC	4" x 4 1/2"	226.2
DOOD	4 1/4" x 4 1/2"	255
6 CYLINDER		
DIX6D	3 5/16" x 4"	248
DIX6-272	3 11/16" x 4 1/4"	272
DJXB	3 1/2" x 4 1/2"	260
DJXC	3 3/4" x 4 1/2"	298
DJXH	3 3/4" x 4 1/2"	298
DJXHF	3 3/4" x 4 1/2"	298
DWXC	4" x 4 3/4"	358

Models	Bore & Stroke	Cu. In. Displ.
DWXD	4 1/4" x 4 3/4"	404
DWXLD	4 1/4" x 5"	426
DWXLDF	4 1/4" x 5"	426
DRXB	4 5/8" x 5 1/4"	474
DRX-501	4 1/2" x 5 1/4"	501
DRXC	4 5/8" x 5 1/4"	529
DFXB	5" x 6"	707
DFXC	5 1/4" x 6"	779
DFXD	5 1/2" x 6"	855
DFXE	5 5/8" x 6"	895
DFXE-TS	5 5/8" x 6"	895
DFXH	5 3/4" x 6"	935
DFXHF	5 3/4" x 6"	935
8 CYLINDER		
DIX-V8 402	4" x 4"	402
DNX-V8C	6" x 6"	1348
DNX-V8D	6 1/4" x 6"	1468
DNX-V8DTS	6 1/4" x 6"	1468

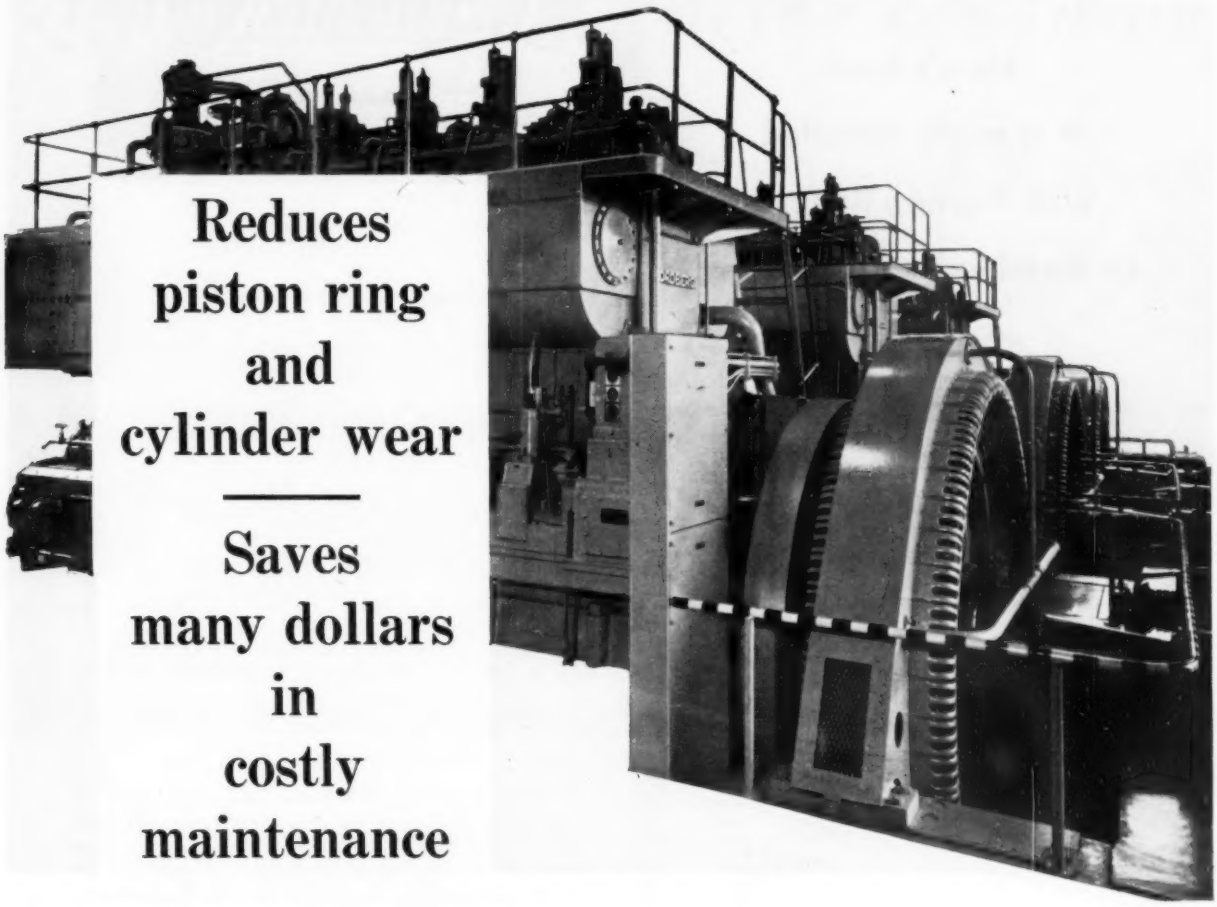
MARINE

DIXD	4 1/4" x 4"	127.5
DIX-4E	3 7/8" x 4"	188
DIX-4ES	3 7/8" x 4"	188
DIX-6E	3 7/8" x 4"	283
DIX-6ES	3 7/8" x 4"	283
DWX-E	4 3/8" x 4 3/4"	428
DWX-ETS	4 3/4" x 4 3/4"	428
DFX-ETS	5 5/8" x 6"	895
DFXH	5 3/4" x 6"	935
DNX-V8D	6 1/4" x 6"	1468
DNX-V8DTS	6 1/4" x 6"	1468

HERCULES Motors Corporation, CANTON, OHIO, U. S. A.

Engine Manufacturing Specialists Since 1915

Shell Rotella Oil



Reduces piston ring and cylinder wear

Saves many dollars in costly maintenance

These dual-fuel engines in the Municipal Power Plant at Houma, Louisiana, supply dependable, low-cost electric power to the entire city. Shell Rotella Oil is the cylinder lubricant.

Here's just one of the many diesel power plants that depend on SHELL ROTELLA OIL for reduced wear of engine parts . . . lower maintenance cost.

The anti-corrosive action in Shell Rotella Oil combats the major cause of engine wear . . . cylinder and piston ring wear caused by acid action from the by-products of incomplete combustion and condensation.

Tougher lubricating film in Shell Rotella Oil gives cylinders and rings greater protection . . . minimizes wear. Its effective detergent-dispersant action prevents harmful deposits.

Write for technical information. See for yourself how Shell Rotella Oil can help reduce your engine maintenance costs.

SHELL OIL COMPANY

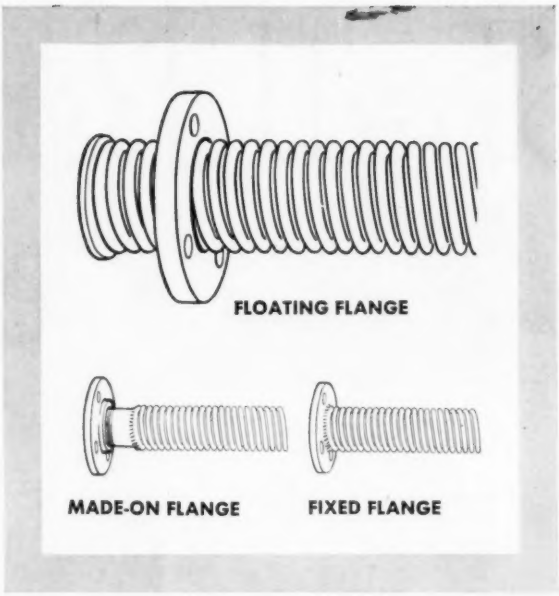
50 WEST 50TH STREET, NEW YORK 20, NEW YORK

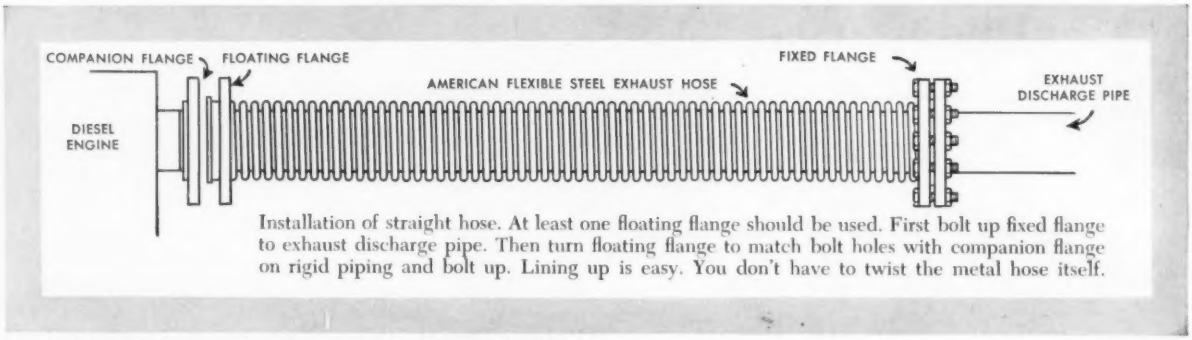
100 BUSH STREET, SAN FRANCISCO 6, CALIFORNIA

SHELL

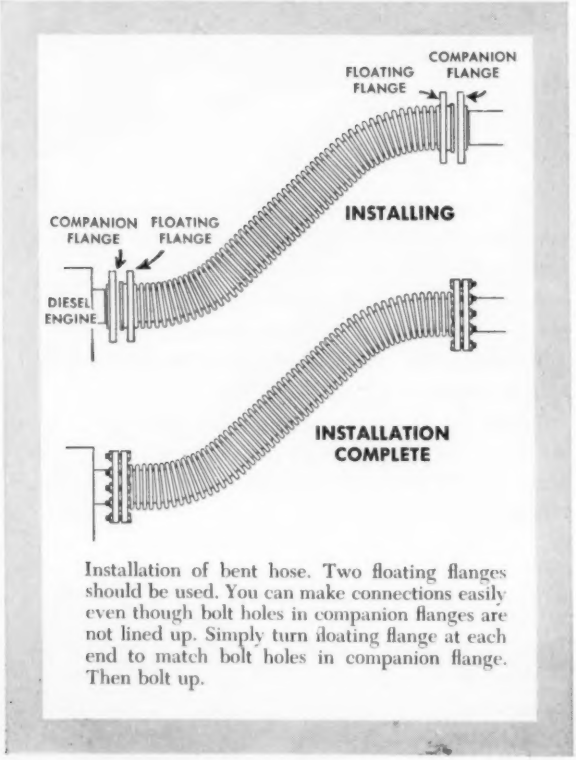
AMERICAN FLEXIBLE STEEL HOSE

Here's how it is easily installed with floating flanges in diesel exhaust systems





Installation of straight hose. At least one floating flange should be used. First bolt up fixed flange to exhaust discharge pipe. Then turn floating flange to match bolt holes with companion flange on rigid piping and bolt up. Lining up is easy. You don't have to twist the metal hose itself.



Installation of bent hose. Two floating flanges should be used. You can make connections easily even though bolt holes in companion flanges are not lined up. Simply turn floating flange at each end to match bolt holes in companion flange. Then bolt up.

American Flexible Steel Exhaust Hose can be supplied with either fixed, made-on or floating flanges. Because this hose is *flexible* it bends into desired position easily. It absorbs vibration readily and prevents its transmission into surrounding structures. It also allows for expansion and contraction caused by temperature changes in the exhaust lines. It prevents overstressing of bolts and distortion of engine parts.

American Flexible Metal Hose for exhaust and air intake – marine or industrial diesels – is available in corrugated steel, 2 in. to 16 in. I.D. inclusive. For more information, write for Bulletin EH-50-1 to: *The American Brass Company, American Metal Hose Branch, Waterbury 20, Conn. In Canada: The Canadian Fairbanks-Morse Co., Ltd.*

OTHER PRODUCTS FOR DIESEL USE – Flexible tubing with wire braid covering for: starting air, circulating water, fuel oil, lubricating oil. Tubing available in bronze, carbon steel and stainless steel. Assemblies complete with fittings. 54214

WHEREVER CONNECTORS MUST MOVE

AMERICAN

flexible metal hose and tubing

an ANACONDA® product

WARNING

of any abnormal engine condition

Synchro-Start SAFETY ALARM SETS

automatically warn with visual and audible signals as soon as such conditions as low oil pressure, low air pressure and overheating, etc. occur.

Three switches are provided — control "on-off" — test — audible alarm cut-off. For added protection these alarm sets may be equipped with automatic shut-down in case signals are not heeded.

Since 1932 Synchro-Start has been manufacturing dependable controls including Solenoids, Overspeed Governors, Relays, Switches and pre-set automatic or manual Control Systems to start, stop and protect internal combustion engines.

Further information upon request.

Synchro-Start Products Inc.

8151 N. RIDGEWAY AVE.
SKOKIE, ILLINOIS

Great new line of

GENERAL MOTORS LOCOMOTIVES

MILWAUKEE GETS 14 NEW 1750-HORSEPOWER SD9 UNITS

To handle heavy tonnage on light rail secondary lines in its western territory, the Chicago, Milwaukee, St. Paul and Pacific is taking delivery this month on 14 new General Motors 6-motor Diesel road switchers. With horsepower increased to 1750, and total weight on drivers kept below 300,000 pounds, *this sure-footed heavy hauler delivers phenomenal drawbar pull.*

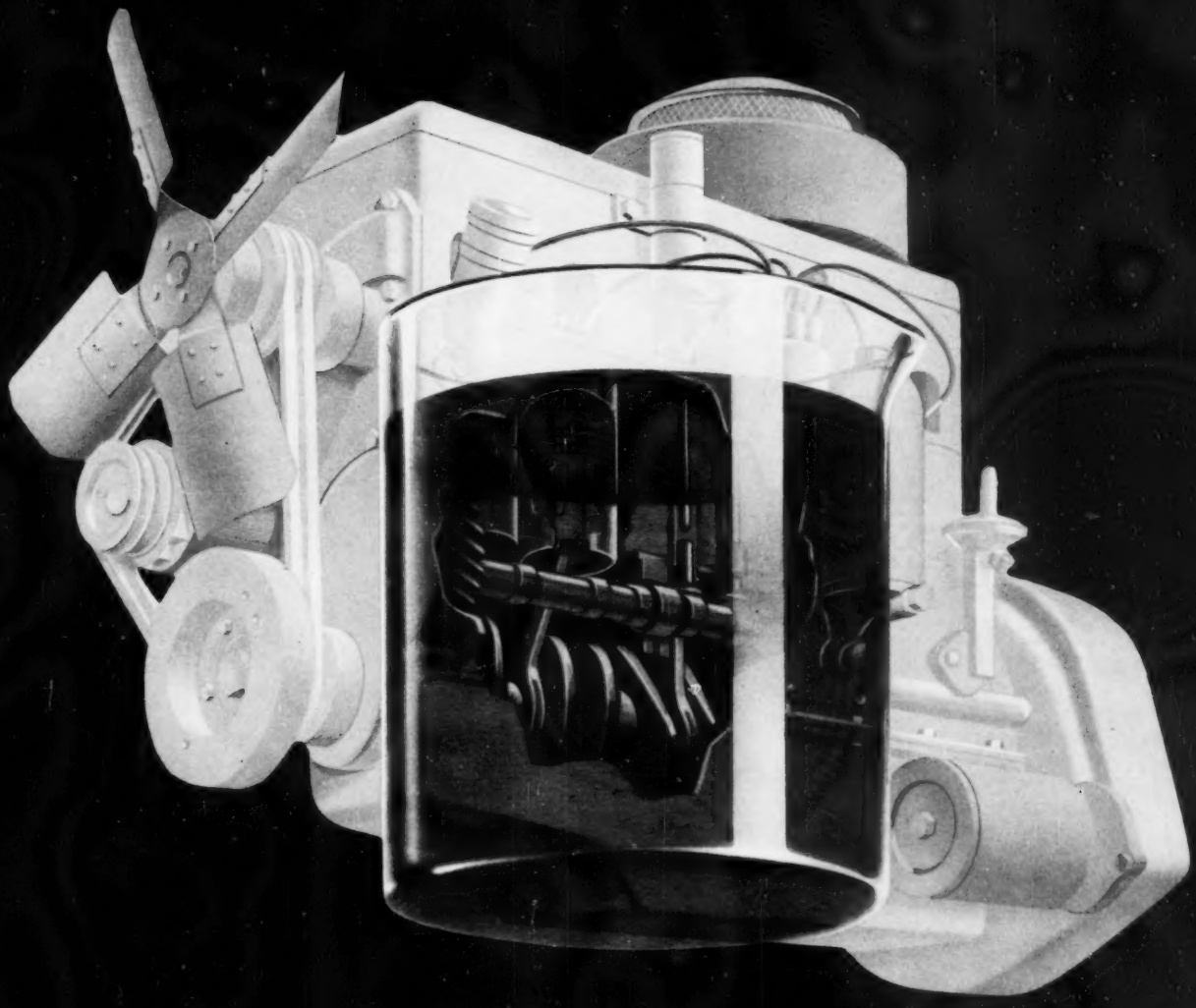
Railroads buy more General Motors Diesel locomotives than any other make because twenty years' experience proves they operate on more dependable schedules—cost less to operate and maintain—*pay for themselves faster than any others!*

THE BEST LOCOMOTIVES ARE EVEN BETTER TODAY!

ELECTRO-MOTIVE DIVISION · GENERAL MOTORS

GENERAL MOTORS LOCOMOTIVES

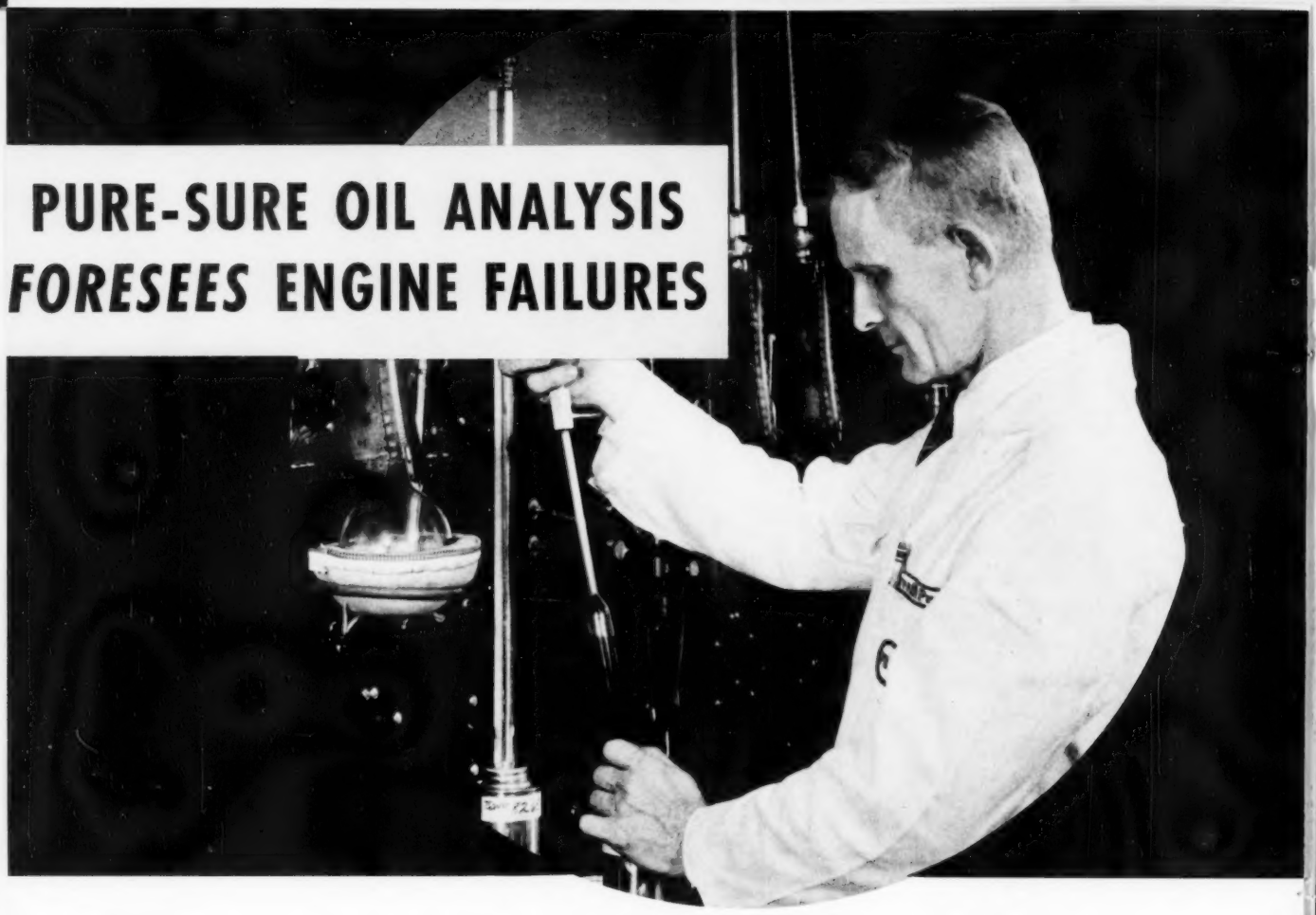
La Grange, Illinois • Home of the Diesel Locomotive • In Canada: GENERAL MOTORS DIESEL, LTD., London, Ontario



Looking at the inside of your engine through a pint of used oil!

Sounds foolish?

No... In a sense, that's just what Pure Oil scientists do—and what they see can save you costly repairs...See for yourself on the next page.



PURE-SURE OIL ANALYSIS *FORESEES* ENGINE FAILURES

FREE trouble-predicting service prevents costly repairs

Keeps fleet units operating at TOP EFFICIENCY!

From careful, scientific analysis of just 1 pint of used motor oil, Pure Oil automotive technicians can tell you what may go wrong with your engine, what will cause it, and what to do now to prevent a costly repair job.

This dollar-saving service—*called Pure-sure Used Oil Analysis*—is offered *free* to fleet users of Pure Oil products. Many take advantage of it on a regular basis to keep their fleet in peak operating condition at all times, and to cut down profit-robbing maintenance bills.

We want *you* to try a sample Pure-sure Analysis on one of your fleet units *free*, to show you how valuable this service can be in your own fleet operation.

For information on how to submit your sample of used oil, call our local Pure Oil office or mail the coupon now!

This offer must be limited to fleet operators in the 24-state area where Pure Oil products are sold.

The PURE OIL COMPANY

Dept. DP-44, 35 East Wacker Drive, Chicago 1, Illinois

Send me information on how I may obtain a Pure-sure Analysis of my used motor oil without cost or obligation.

NAME _____

TITLE _____

COMPANY _____

ADDRESS _____

CITY _____ STATE _____

THE PURE OIL COMPANY, U.S.A.

PURE

Be sure with Pure

Sales offices located in more than 500 cities in Pure's marketing area

4054

Payload...75 Tons

World's largest truck uses MIEHLE-DEXTER SUPERCHARGERS

Dumping 75 tons of sand . . . or hauling copper ore up 18% grades from pit to crusher—that's the every-day job of these giant M-D supercharged trucks used by an Arizona open-pit copper mine.

...moves more material faster at lower cost!

It takes *supercharged* power to haul a load like this! When Buda Diesels were selected to power the world's biggest truck, they made *sure* of *plenty of power* with Miehle-Dexter Superchargers. Buda's experience is typical. They find that simply adding an M-D Supercharger to their engines *boosts horsepower as much as 50% or more!* What's more, weight per horsepower is decreased. Little wonder that Miehle-Dexter Superchargers are found on so many of the country's leading Diesel engines.

You, too, can keep pace with the race for more horsepower by using M-D superchargers on your engines. The investment is usually far less than required by other methods. Write for bulletin.

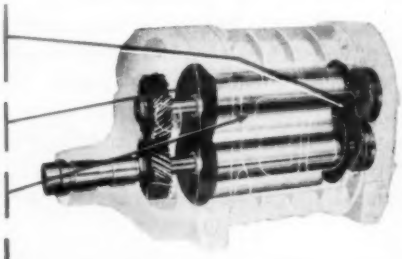
Only MIEHLE-DEXTER gives you all these features!

Internal construction uses patented rubber end plate seals. Eliminates metal contact, assures longer life, achieves fuel savings.

Special wear strips on rotors eliminate metal-to-metal contact, assure longer wear.

Lightweight aluminum rotors and housing boost power without adding weight.

Standardized parts allow easy field service.

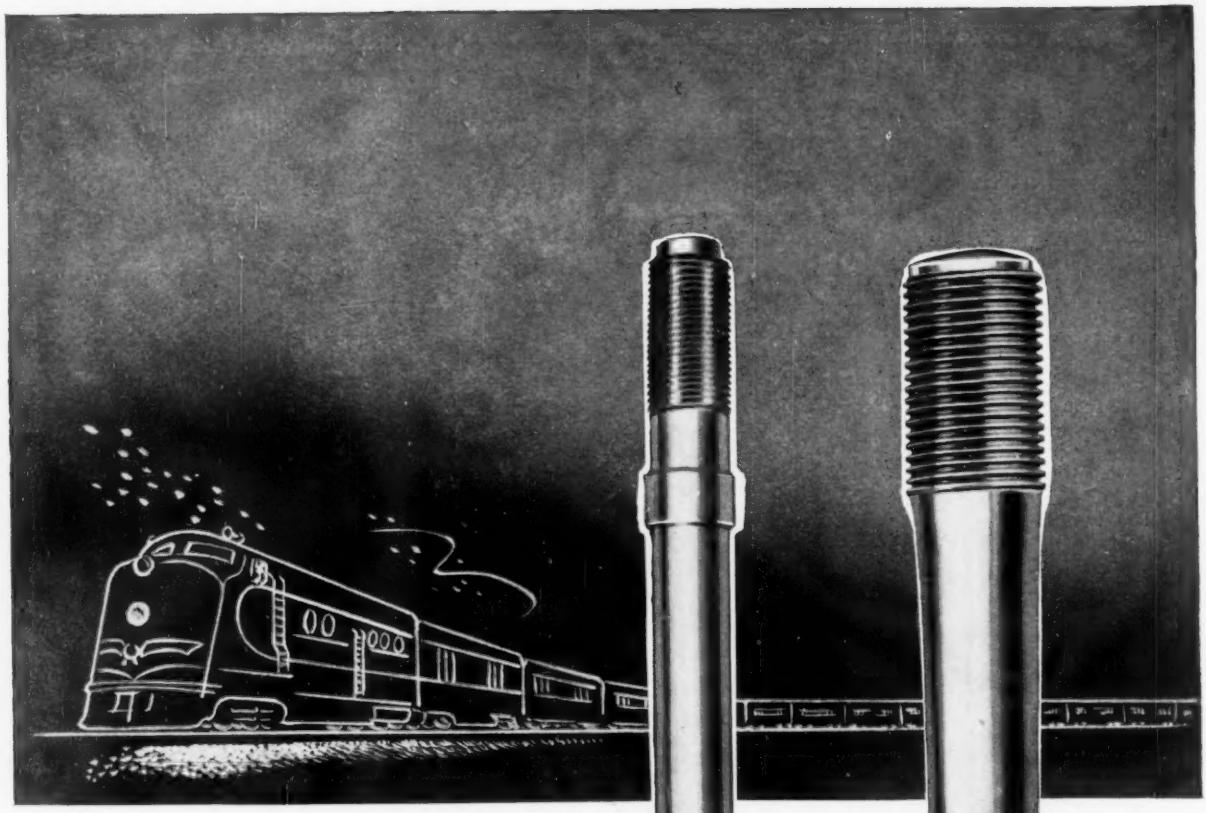


MIEHLE-DEXTER SUPERCHARGER

DIVISION OF THE DEXTER FOLDER COMPANY

100 Fourth Street • Racine, Wisconsin

Trust M-D Superchargers for [illegible] engines . . . use them for blower and air compressor operations, too.



Rely upon *Specialists* for PRECISION ALLOY STEEL Diesel Engine Studs and Bolts

THE STRESSES set up by the greater power and higher speeds of today's Diesel Engines demand precision bolting design and manufacture. To meet your specific requirements in producing the correct bolting for your job, is our business. Specializing thus for nearly a half century Erie craftsmen have worked with hundreds of equipment builders to help them produce better industrial machines, better Diesel engines. We are geared to meet your most exacting bolting specifications. Our long experience includes serving the Nation's largest builders of Diesel Engines. May we work with you?

ERIE BOLT & NUT CO.
ERIE, PA.

A SUBSIDIARY OF Barium STEEL CORPORATION
Steelwright to the Nation

STUDS • BOLTS • NUTS ~ ~ ALLOYS • STAINLESS • CARBON • BRONZE

REPRESENTATION IN PRINCIPAL CITIES

TOCCO* and the Diesel Industry Progress Together

● In the manufacture of many Diesel engine and accessory Parts TOCCO Induction Heating has proved a sound method of increasing product quality, speeding production and lowering unit costs. TOCCO-hardening of vital parts prevents wear, insures 5 to 10 times longer life—with consequent customer satisfaction.

A Partial List of Manufacturers of Diesel Engines and Accessories Who Use TOCCO-Hardened Parts

American Locomotive Company
The Auto Car Co.
Baldwin-Lima-Hamilton Corp.
The Buda Company
Caterpillar Tractor Co.
Cleveland Diesel Engine Div., GMC
Continental Motors Corp.
The Cooper-Bessemer Corp.
Cummins Engine Co., Inc.
Detroit Diesel Engine Div., GMC
Electro-Motive Division, GMC
Hercules Motors Corp.
International Harvester Co.
The National Supply Co.
Waukesha Motor Co.
Eaton Manufacturing Company
Link-Belt Company
Worthington Pump and Machinery Corp.
Thompson Products Company

And These Are Some of the TOCCO-Hardened Parts They Use

Crankshafts
Camshafts
Axle Shafts
Piston Pins
Shifter Rods
Adjusting Screws
Cylinder Liners
Rocker Arms
Cam Followers
Valves
Rocker Arm Shafts
Timing Gears
Shifter Forks
Transmission Gears
Final Drive Gears
Spiders
Universal Joint Assemblies

TOCCO Engineers can probably find applications in your plant, too, where TOCCO Induction Heating can improve product quality, increase production and lower costs. Such a survey costs you nothing and may save you a great deal.

THE OHIO CRANKSHAFT COMPANY

Mail Coupon Today

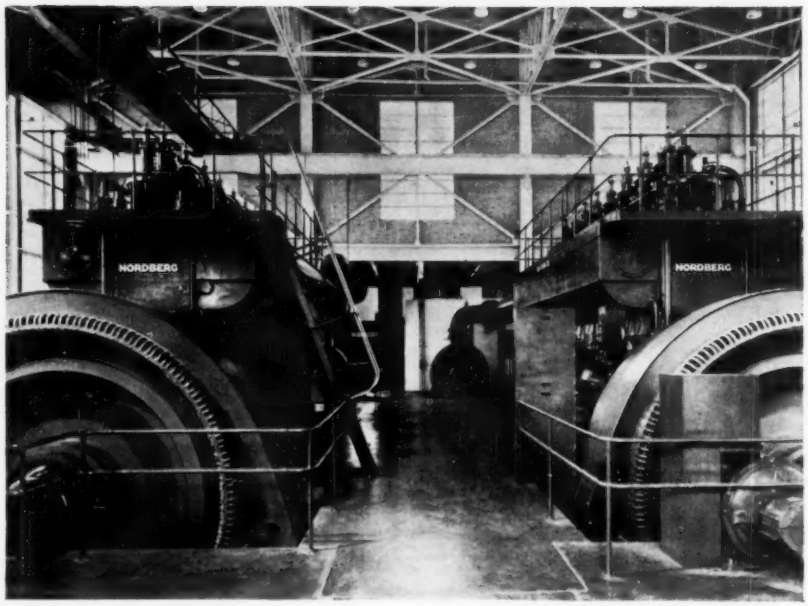
NEW **FREE** BULLETIN

THE OHIO CRANKSHAFT CO.
Dept. L-4, Cleveland 1, Ohio

Please send copy of "Typical Results of TOCCO Induction Hardening and Heat Treating"

Name_____
Position_____
Company_____
Address_____
City_____ Zone____ State_____

W. T. Elliott,
Power Plant Supt.,
says...



"We've Got Facts to Prove Rubilene's Superiority"

A lot of people depend on Mr. W. T. Elliott. For it's his job as Power Plant Supt. to see that the City of Denton, Texas has unfailing light and power 24 hours a day. To help live up to that responsibility, Mr. Elliott pampers his hard working Nordberg Duafuel® engines — makes sure they're lubricated with the finest oil available. He says, "We've been using Sinclair RUBILENE® since 1948 with *very satisfactory results*. Cylinder liner wear is only ⅓ of 0.001 inch per 1,000 hours running. Piston ring life is 16,000 hours of operation and we get 6,100 H.P. hours per gallon of oil... Facts like those have definitely sold me on RUBILENE."

Why not let the facts prove to you, too, RUBILENE is a superior lubricating oil. Phone your local Sinclair Representative or write to Sinclair Refining Company, 600 Fifth Avenue, New York 20, N. Y.

SINCLAIR DIESEL LUBRICANTS

save wear and replacements

At last...a proven better way to kill Diesel Exhaust Fumes!

NEW OCM DIESELER

Cleaner, safer air wherever you run a 4-cycle diesel engine — better control of noxious diesel exhaust fumes — that's what this tremendously important new catalytic invention means to you today.

The OCM Dieseler reduces — below objectionable levels — dangerous hydrocarbons and carbon monoxide in exhausts from all 4-cycle diesel engines. Compact catalytic units "burn out," by catalytic reaction, 65-85% of the unpleasant, harmful fumes — 80-90% of the dangerous carbon monoxide — whenever your engine is operating at over 60% load.

Think what this means almost everywhere diesel engines are used!

Now, with the OCM, it is possible for some mine operators to use standard diesel equipment underground.

Now 4-cycle diesel bus and truck operators can promote better public relations and good will by eliminating foul-smelling smoky exhausts.

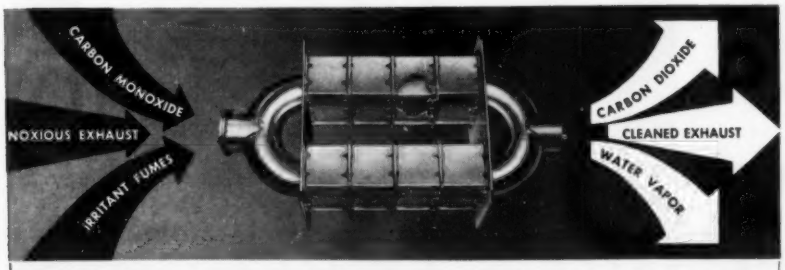
Now both stationary and mobile diesel-powered equipment can run more efficiently in industrial plants.

Requires Little or No Maintenance

The OCM Dieseler is designed to replace any standard diesel muffler. It can be connected to the engine exhaust manifold quickly and easily by your own mechanics. It is strong, compact and rupture proof. Maintenance is practically nil. Tests show that the Dieseler will give you up to 2000-2500 hours of trouble-free service before the catalytic units need renewal. Replacement is simple and low cost.

A Houdry Catalyst

The OCM Dieseler was invented by Eugene Houdry, who developed the catalytic process for cracking petroleum and who is world-renowned in the field of catalytic research. Almost anywhere you use 4-cycle diesel equipment, the OCM Dieseler can bring important benefits to you — in more efficient performance, in increased employee productivity and morale, and often in better public relations as well. Mail the coupon for complete information and technical data now.



OCM Dieseler, Duoflow model. Catalytic units (see cutaway) oxidize irritating, dangerous exhaust fumes and odors to harmless carbon dioxide and water vapor. Uniflow and Quadriflow models also available to equip almost any size engine.

OCM CATALYTIC EXHAUST FOR GASOLINE ENGINES

The OCM Catalytic Exhaust does for any engine burning non-leaded gasoline all that the Dieseler does for diesel equipment.

This Catalytic Exhaust eliminates 95% or more of the carbon monoxide — 90% of the hydrocarbons — from any engine in which you use non-leaded gasoline. With the OCM Catalytic Exhaust you can operate lift trucks, tow trucks, loaders, auxiliary generators in even closely confined areas continuously, efficiently and *safely*. Wherever you use gasoline-powered equipment indoors, you need the OCM Catalytic Exhaust.

OXY-CATALYST, Inc.

WAYNE, PA.

MANUFACTURING • ENGINEERING • RESEARCH

Fume elimination processes and equipment for internal combustion engines—for incinerators—for consumer products—and for industrial air pollution control and heat recovery.

NOTE. Dealerships for both OCM Exhausts are now available in most major markets. Write for full details.

OXY-CATALYST, INC., Wayne, Pa.

Send complete information on ☐ OCM Dieseler; ☐ OCM Catalytic Exhaust for gasoline engines.

☐ I am interested in a dealership

Name_____ Title_____

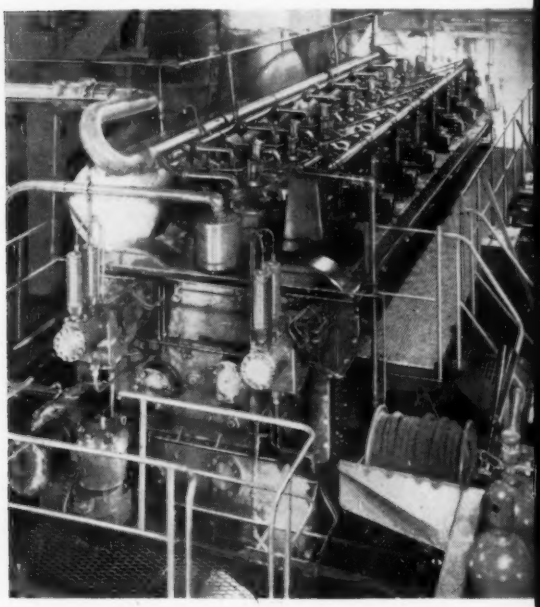
Firm_____

Street_____

City_____ Zone_____ State_____

Here's how you can cut diesel engine fuel costs 35.3%

This big (21½ x 27½), slow speed (240 to 257 rpm) Hamilton diesel is saving marine and stationary users 35.3% on fuel costs, because . . .



ANALYSIS (by E. W. Saybolt & Co.) of 1 gallon sample of #6 fuel oil burned in this ore carrier's Hamilton engine:

Specific Gravity @ 60° F.	0.9705
Gravity, API @ 60° F.	14.3
Flash, PM CC	235° F.
Fire, C.O.C.	375° F.
Visc. SU @ 100° F.	4965 Sec.
Visc. SF @ 122° F.	183 Sec.
Pourpoint, ASTM	50° F.
Saybolt Univ. @ 210° F.	169
Sulfur, ASTM	0.80%
B.S. & W.	0.3%
B.T.U. Per Pound HV	18,516
Hydrogen	11.46%
B.T.U. Per Pound LHV	17,443
Oxygen (By difference)	0.90%
Specific Gravity @ 160° F.	0.9358

It is able to burn unblended heavy residuals. Above is a recent analysis of typical #6 fuel oil used successfully by a Great Lakes ore carrier.

An exhaust as clean as this (above) proves the Hamilton's spherical combustion chamber and exclusive rotary valve promote thorough combustion of such low cost heavy fuels.

"Each year, because of interest in this ship, we have had engineers present at its annual overhaul to check on results secured from use of our products.

"It was felt by all this year that the engine was just about the cleanest engine we have ever observed in many years of marine service. Especially so, considering the use of the varying types of heavy bunker fuel oil.

"The complete absence of varnish or other deposits, in the cylinder liners and pistons; the absence of stuck rings; and the minimum of deposits in the liner ports was remarkable. It would appear that liner wear and piston ring wear have become stabilized at a normal, or possibly even subnormal, rate."

Further proof of the efficiency of this diesel is the above statement by a representative of the oil company supplying the lubricants for this ore carrier.

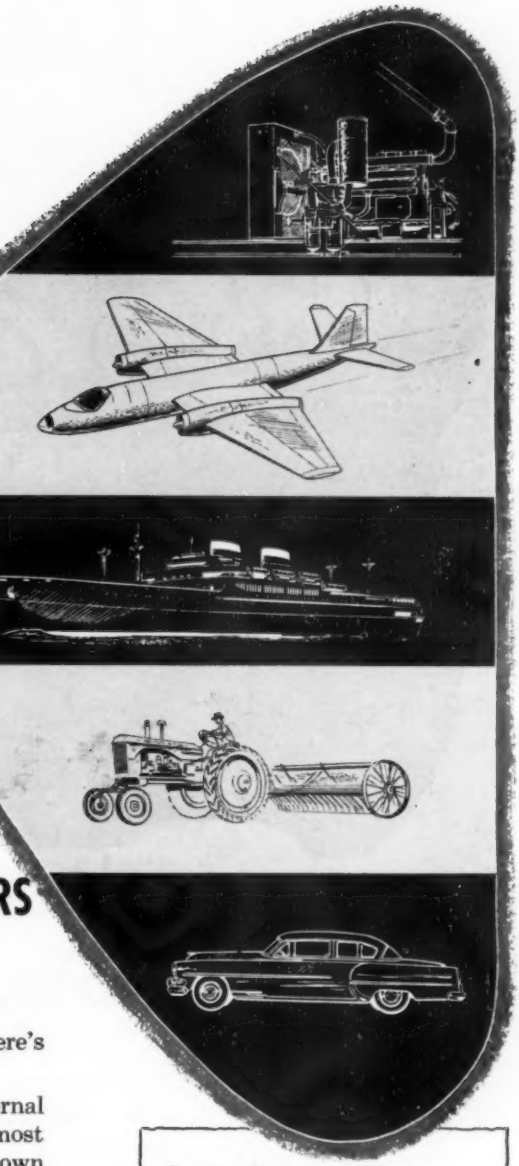
These facts add up to this . . . for stationary or marine service, HAMILTON DIESELS are by far the soundest investment you can make!

Hamilton Division, Hamilton, Ohio

BALDWIN-LIMA-HAMILTON

PUROLATOR FILTERS

FULL-FLOW
FUEL
LUBE
HYDRAULIC
AIR



Preferred by more ORIGINAL EQUIPMENT MANUFACTURERS than any other make—

NEXT TIME the question of filtration comes up, here's something worth remembering—

The majority of America's best known builders of internal combustion equipment choose Purolator* filters. In most instances, their choice is based on results of their own impartial tests. Purolator filters—inch for inch, and pound for pound—give finer, more dependable filtration at optimum flow rates.

Quickest way to get acquainted with the almost one thousand different types of Purolator filters is to send for the catalogs. Use the coupon!

*Reg. U. S. Pat. Off.

Do you have a problem in filtration?

Purolator maintains the world's largest specialized filter research and engineering laboratories. Your filter problems—small or large—are always welcome at Purolator's Engineering Department.

PUROLATOR PRODUCTS, INC.
Rahway, New Jersey and Toronto, Ontario, Canada
Factory Branch Offices: Chicago, Detroit, Los Angeles

PUROLATOR
WORLD'S FINEST OIL FILTER

Purolator Products, Inc.
Rahway, N. J.
Send the following
Purolator Catalogs—

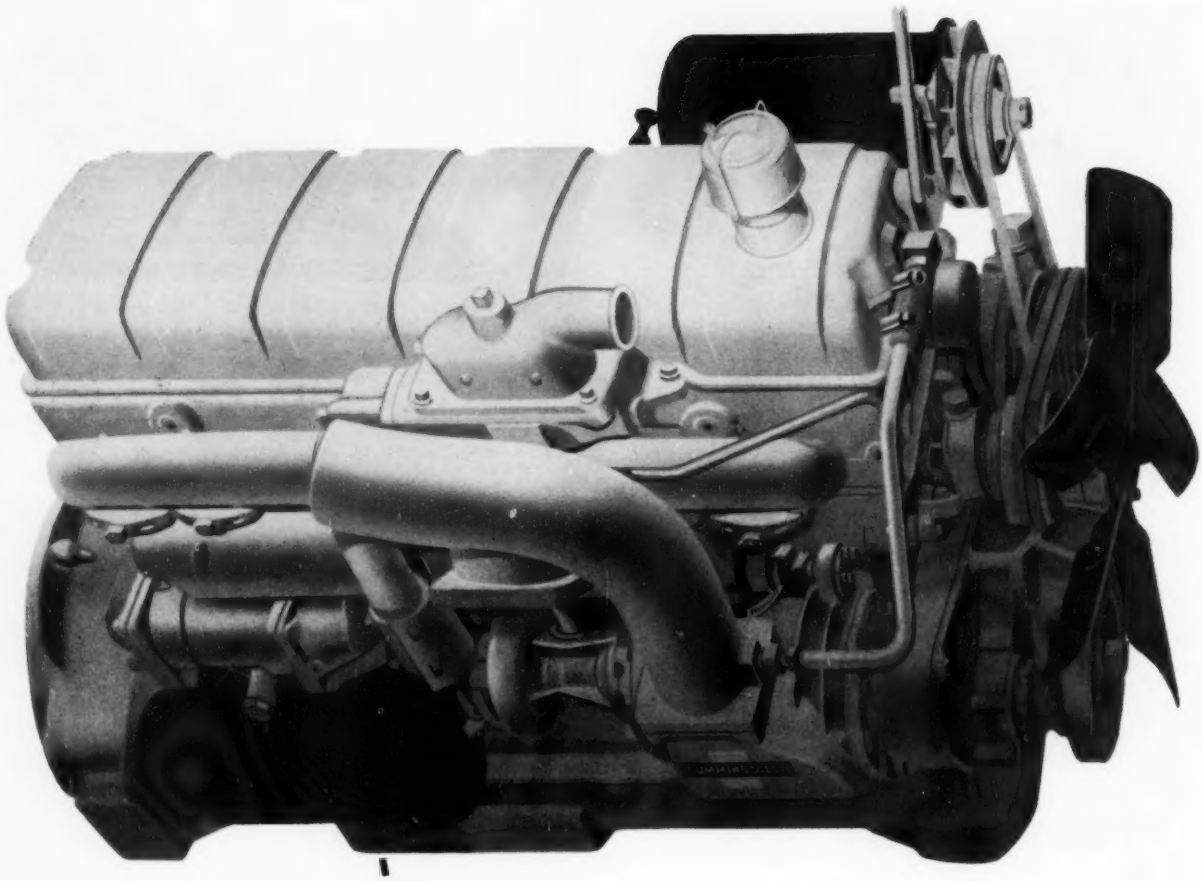
☐ Industrial ☐ Aviation ☐ Automotive ☐ Fleet

Name_____ Title_____

Company_____

Address_____

_____



150 h.p. JBS 600 gives Cummins Diesel economy

CUMMINS **Cummins**

Engine Company, Inc. • Columbus, Indiana

Cummins newest diesel cuts fuel costs as much as 33%

and performance to medium heavy trucks!

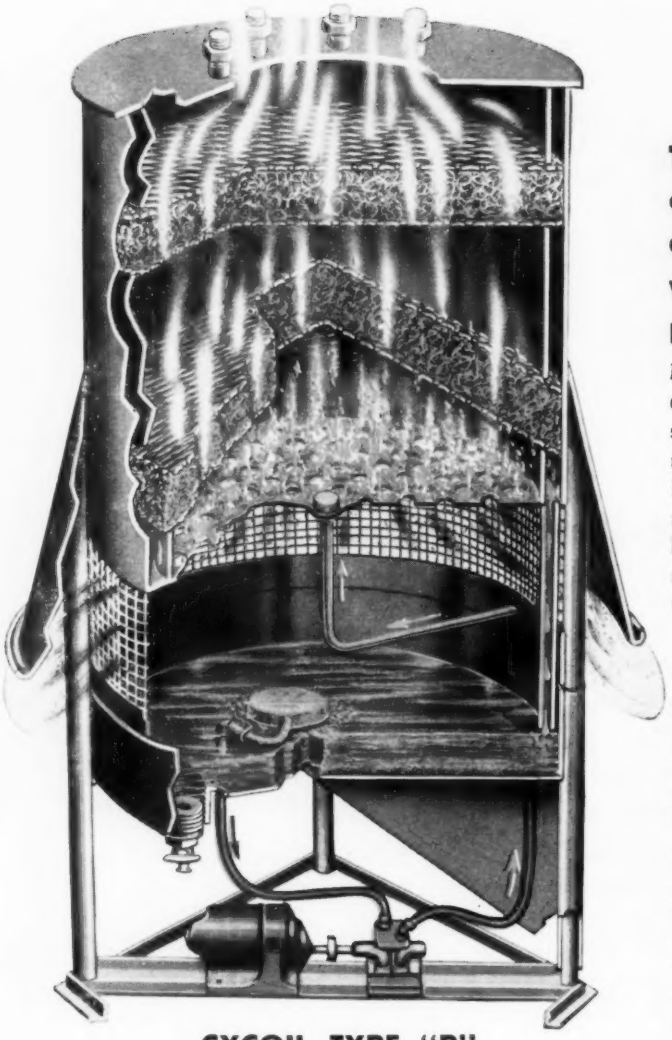
This diesel is engineered especially for medium heavy-duty truck service. It features rugged 4-cycle design for long life and minimum maintenance costs.

It embodies all the features of the exclusive Cummins system of fuel metering and injection; is simple and easy to maintain. This system has made Cummins Diesels famous for greater efficiency under all operating and load conditions. Every gallon of fuel produces more mileage and the JBS-600 gives top performance on less expensive diesel fuel. *(No. 2)*

The Cummins JBS-600 Diesel is offered as standard or optional equipment by the leading truck and bus manufacturers. Their local representative or the Cummins dealer in your area will give you specifications.

Leader in rugged, lightweight, high-speed diesel engines [60-600 h.p.]

THE NEW Cycoil OIL BATH



CYCOIL TYPE "P"

The only high efficiency oil bath air cleaner that meets the lower allowable intake resistance demanded with use of turbo-chargers and pressure blowers for scavenging.

Progress always creates new problems. With modern engines making wider use of turbo-chargers and pressure blowers for scavenging, the need for an entirely new and different oil bath air cleaner was apparent. Lower allowable intake resistance was a "must" accompanied by high cleaning efficiency and large dust holding capacity. Here was a new job for Cycoil—and AAF engineers accepted the challenge. The new Cycoil, Types "P" and "PV", is their answer.

A New Method of Oil Entrainment

The original Type "W" Cycoil impinged the air upon the oil at high velocity. The new Cycoil Type "P" accomplishes this entrainment by means of a perforated plate in the air stream over which oil flows from the central distributing head.

Here's how it works. The metered orifices in the plate are calibrated to increase the velocity of air flow through the openings to entrain the oil that tends to spill over the edges and at the same time distribute the air flow uniformly over the filter area.

The air leaving the perforated plate with its oil and dust content passes upward into a conical shaped filter designed to accelerate the flow of the collected oil droplets to the perimeter of the filter out of the air

American Air Filter

COMPANY, INC.

415 Central Avenue, Louisville 8, Kentucky • American Air Filter of Canada, Ltd., Montreal, P. Q.

MODERN ENGINE DESIGN DEMANDS IT!

AAF RESEARCH SUPPLIES IT!

LOW RESISTANCE TYPE AIR CLEANER

stream. This washing action keeps the filter clean and the dirty oil flows back to the reservoir where dust and grit settle out as sludge. A secondary filter is provided to remove any oil mist that might escape the conical filter.

The oil reservoir, at bottom, is hinged to swing clear of the Cycoil casing for easy sludge removal and oil replacement. A small motor driven oil circulator supplies a constant flow of oil over the orifice plate.

Two Types Permit High Efficiency Dust Removal From 10% of Rating To Full Capacity

The Cycoil Type "P" with standard metered orifices maintains a high efficiency in dust removal from *50% of rated capacity to maximum rating.*

The Cycoil Type "PV" is identical to the Type "P" except that hinged Vari-flow valves are added to maintain a constant ratio of orifice openings to air velocity. This single addition permits positive oil entrainment and sustained high cleaning efficiency *from as low as 10% of rating to full capacity.*

For the Hot Climates— Cycoil With Evaporative Cooler!

The Cycoil Type "P" is also available with an evaporative cooler using the perforated-plate principle to evaporate the water. This self-contained, combination unit features two perforated plates and filters in series, one flooded with water to cool the air and the other flooded with oil to remove the dust. Still another arrangement is applicable to engines using aftercoolers.

CYCOIL TYPE "PV" with Vari-flow valves

AAF

MAIL THIS COUPON, NOW!

American Air Filter Co.
445 Central Ave., Louisville 8, Ky.

Send me free copy of Bulletin No. 160 describing the new Cycoil Low Resistance Oil Bath Air Cleaner.

Name_____

Company_____

Street_____

City_____ State_____

SENSATIONAL MILEAGE

STOPS! RING GROOVE WEAR

Double Bonded

METALLURGICALLY Al-Fin Bond

MECHANICALLY Zollner Lock

ZOLLNER

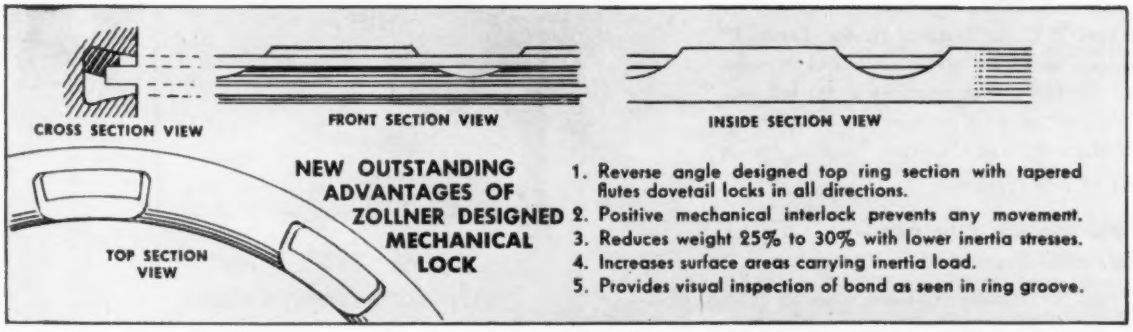
"Ni-Resist" Iron Top Ring Section

BOND LOC*

For Extra Heavy Duty Service

PISTONS

Up to 5 times more mileage is typical of this great new piston development by Zollner engineers. Designed for the most severe service, the BOND-O-LOC Piston has a "Ni-resist" iron top ring groove section *permanently* incorporated by *both* Al-Fin metallurgic bond and the exclusive Zollner mechanical lock. Separation failure is impossible. Reverse angles on every surface joining the "Ni-resist" iron section provide a multiple dovetail bond which is infinitely wedge-locked. Ring groove wear problems are eliminated, blow-by prevented, oil consumption reduced, mileage between overhauls greatly increased. Many heavy duty engine builders have already tested and approved BOND-O-LOC advantages. Request complete information, now.



NEW OUTSTANDING ADVANTAGES OF ZOLLNER DESIGNED MECHANICAL LOCK

1. Reverse angle designed top ring section with tapered flutes dovetail locks in all directions.
2. Positive mechanical interlock prevents any movement.
3. Reduces weight 25% to 30% with lower inertia stresses.
4. Increases surface areas carrying inertia load.
5. Provides visual inspection of bond as seen in ring groove.

Licensed under Patents 2,396,730; 2,455,457; 2,550,879 * T. M. Reg. Pat. App. For

- ADVANCED ENGINEERING
- PRECISION PRODUCTION

in cooperation with engine builders

ZOLLNER PISTONS

THE ORIGINAL EQUIPMENT PISTONS

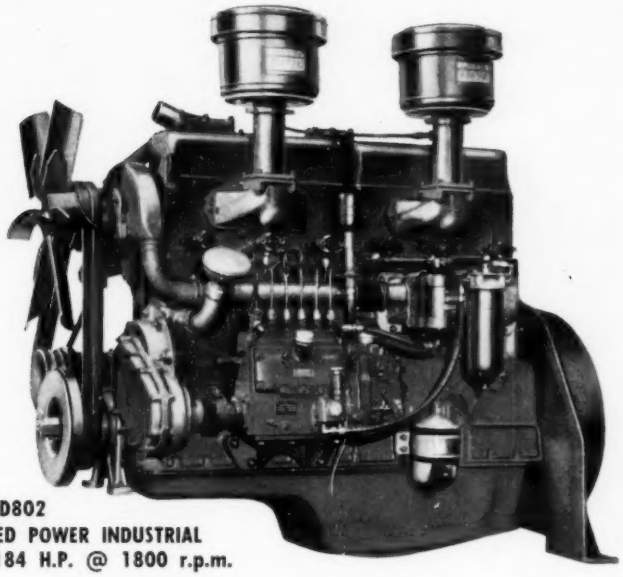
ZOLLNER

ZOLLNER MACHINE WORKS • Fort Wayne, Indiana

CONTINENTAL

*CUSHIONED POWER DIESELS

15 to 217 HORSEPOWER



MODEL SD802
CUSHIONED POWER INDUSTRIAL
DIESEL. 184 H.P. @ 1800 r.p.m.

There are three main reasons why Continental's Cushioned Power principle results in higher performance and more efficient operation.

1. **Combustion chamber design assures higher turbulence, promotes cleaner burning. All fuel is utilized.**

•

2. **Operation is smoother. Cushioning of the explosive force results in reduction of noise.**

•

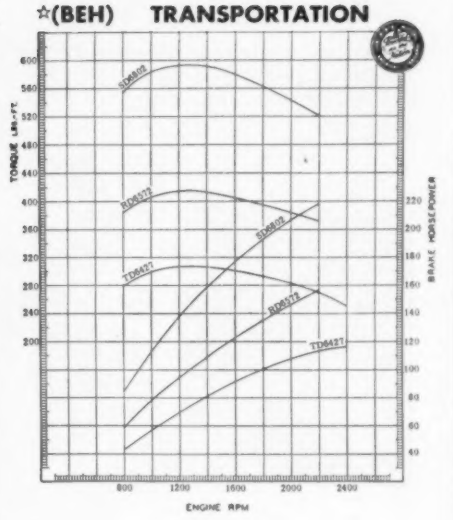
3. **Easing of peak forces on rods, shafts, and bearings makes for longer service, with less time out for repairs. By permitting wide interchangeability of parts with Red Seal* gasoline models, it greatly simplifies the job of service in the field.**

Continental Cushioned Power Diesels are now available for various applications in transportation, agriculture and industry. Write for bulletins and color folder showing how Cushioned Power works.

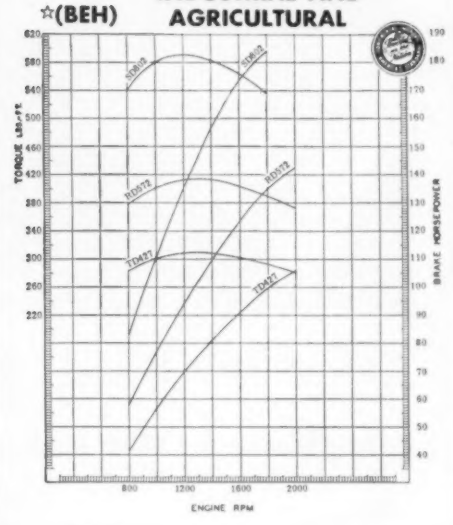
PARTS AND SERVICE COAST TO COAST

*TM REG.

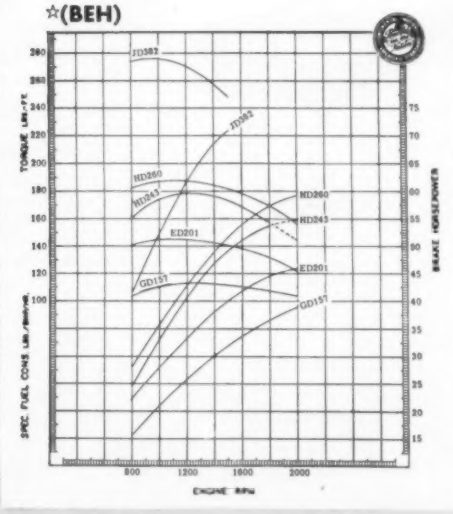
☆(BEH) **TRANSPORTATION**



☆(BEH) **INDUSTRIAL AND AGRICULTURAL**



☆(BEH)



☆(BEH) BARE ENGINE HORSEPOWER. JD, HD AND ED MODELS FOR INDUSTRIAL APPLICATIONS ONLY.

CONTINENTAL MOTORS · Powerful as the Nation · AMERICA'S STANDARD

Continental Motors Corporation
MUSKEGON, MICHIGAN

1819 BROADWAY, NEW YORK 23, NEW YORK • 1252 OAKLEIGH DRIVE, EAST POINT (ATLANTA) GA. • 6218 CEDAR SPRINGS ROAD, DALLAS 9, TEXAS • 3817 S. SANTA FE AVE., LOS ANGELES 58, CALIF. • 910 S. BOSTON ST., ROOM 1008, TULSA, OKLA.

AEROQUIP HOSE LINES . . . as near as your telephone in 106 industrial areas

Flexible Hose Lines with reusable Fittings

Self-Sealing Couplings

The solution to Diesel engine plumbing problems is as near as your telephone. The man to call is your Aeroquip distributor. His thorough experience with stationary, mobile, and marine Diesel applications qualifies him to be of assistance to you. He stocks a complete supply of Aeroquip Hose, detachable and reusable Fittings, and Self-Sealing Couplings. He can show you how to save time and expense by making your own hose assemblies from bulk stock. If you are located in or near one of the cities listed, you'll find your Aeroquip distributor's name in the Yellow Page Section of your telephone directory under the familiar Aeroquip Trade Mark.

ALABAMA—Birmingham
Montgomery • Mobile
ARIZONA—Phoenix • Tucson
ARKANSAS—Little Rock
CALIFORNIA—Eureka • Los Angeles • San Francisco • Oakland Fresno • Sacramento • Glendale Redding • San Diego • El Centro
COLORADO—Denver
CONNECTICUT—Hartford
Bridgeport
DELAWARE—Wilmington
FLORIDA—Miami Springs
Tampa • Jacksonville • Coral Gables • Orlando • Ocala
GEORGIA—Atlanta • Macon
Augusta
ILLINOIS—Springfield • Chicago
Decatur • La Salle • Peoria
INDIANA—Indianapolis • South Bend • Evansville • Fort Wayne
IOWA—Des Moines • Davenport
Sioux City
KANSAS—Wichita
KENTUCKY—Louisville
Paducah
LOUISIANA—New Orleans
Shreveport
MAINE—Portland
MARYLAND—Baltimore
MASSACHUSETTS—Boston
MICHIGAN—Lansing • Muskegon Saginaw • Flint • Detroit • Jackson
MINNESOTA—St. Paul • Duluth
Minneapolis
MISSISSIPPI—Jackson
MISSOURI—St. Louis
Kansas City
MONTANA—Billings
NEBRASKA—Omaha
NEVADA—Reno
NEW JERSEY—Newark
East Orange
NEW YORK—Buffalo
Manhattan • Queens • Brooklyn
NORTH CAROLINA—Raleigh
High Point
NORTH DAKOTA—Minot
OHIO—Dayton • Sandusky
Toledo • Cincinnati • Columbus
Cleveland
OKLAHOMA—Tulsa • Enid
OREGON—Portland
PENNSYLVANIA—Philadelphia
Erie • Pittsburgh • Lancaster
Harrisburg
SOUTH DAKOTA • Sioux Falls
TENNESSEE—Memphis
Knoxville
TEXAS—Fort Worth • Dallas
Odessa • Longview • Houston
Corpus Christi • Beaumont
UTAH—Salt Lake City
VIRGINIA—Norfolk • Salem
Richmond
WASHINGTON • Spokane
WEST VIRGINIA—Charleston
Bluefield • Williamson
WISCONSIN—Milwaukee

Aeroquip

REG. TRADE MARK

AEROQUIP CORPORATION, JACKSON, MICHIGAN

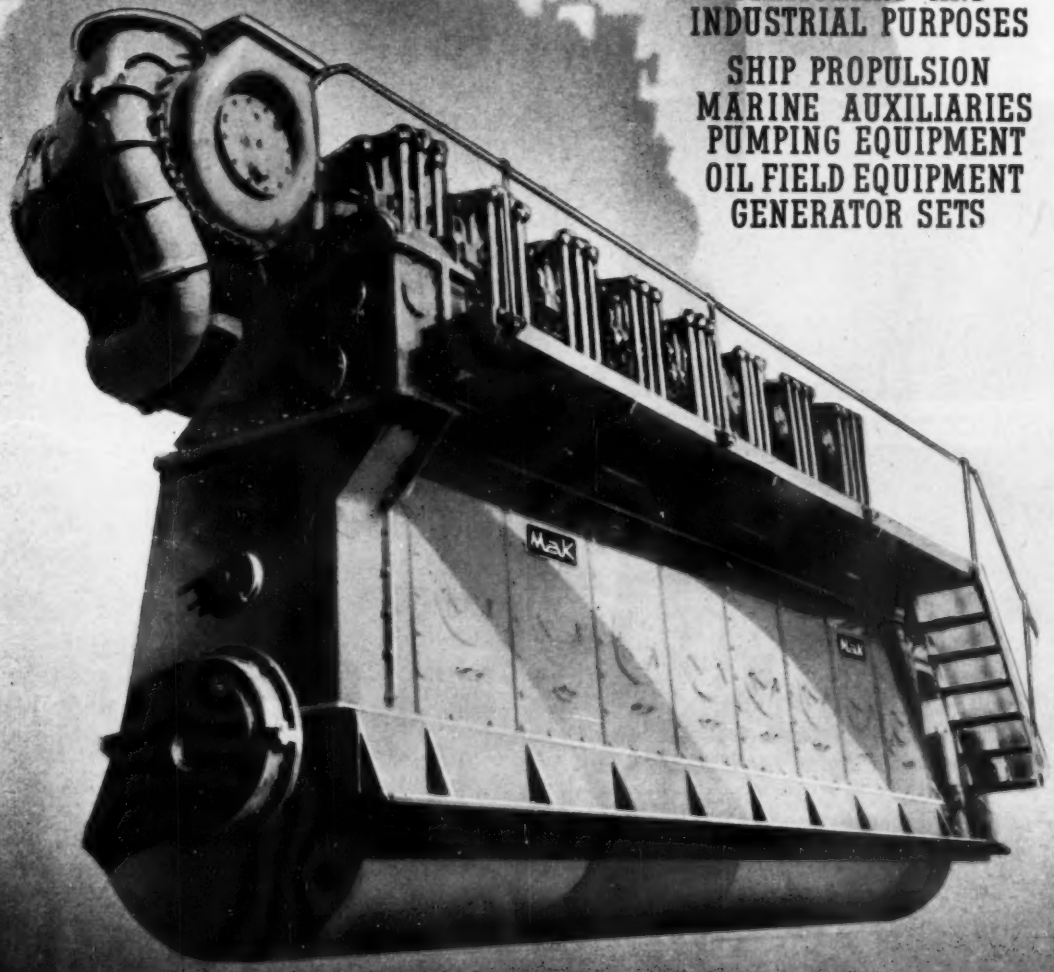
SALES OFFICES: Burbank, Calif. • Dayton, Ohio • Hagerstown, Md. • High Point, N. C. • Miami Springs, Fla. • Minneapolis, Minn. • Portland, Ore. • Van Wert, Ohio • Wichita, Kan.
IN CANADA: Prenco Progress and Engineering Corporation Ltd., Toronto • **IN ENGLAND:** Super Oil Seals & Gaskets, Ltd., Birmingham

AEROQUIP PRODUCTS ARE FULLY PROTECTED BY PATENTS IN U.S.A. AND ABROAD

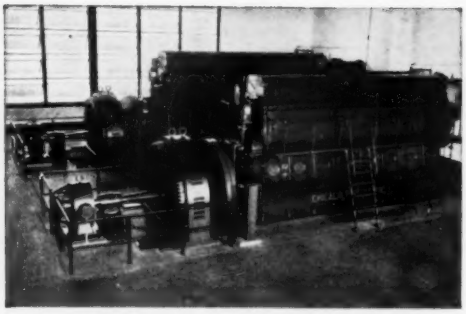
MaK Diesel

FOR MARINE-
STATIONARY- AND
INDUSTRIAL PURPOSES

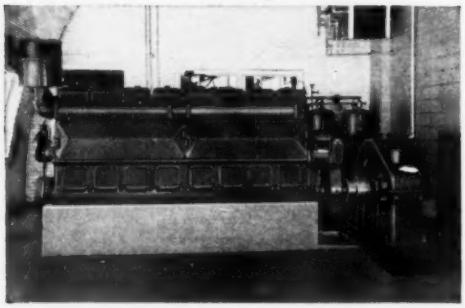
SHIP PROPULSION
MARINE AUXILIARIES
PUMPING EQUIPMENT
OIL FIELD EQUIPMENT
GENERATOR SETS



MASCHINENBAU KIEL AKTIENGESELLSCHAFT · MaK

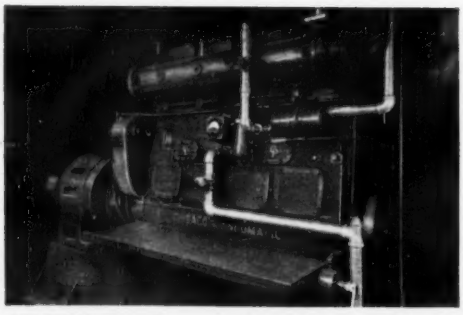


Two 1000 KW units in a Midwestern Public Utility.

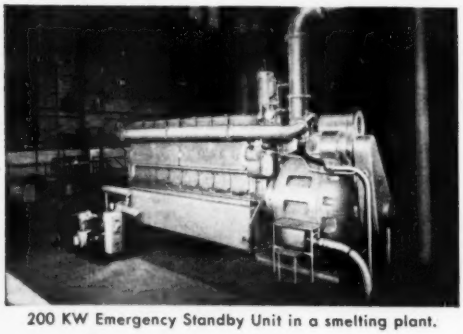


CP 400 HP Diesel in a petroleum pipeline station.

for INDUSTRY *or* MUNICIPALITY...



100 KW Sewage Gas engine in an Eastern municipality.



200 KW Emergency Standby Unit in a smelting plant.

CP medium and slow speed diesel, gas or dual-fuel engines

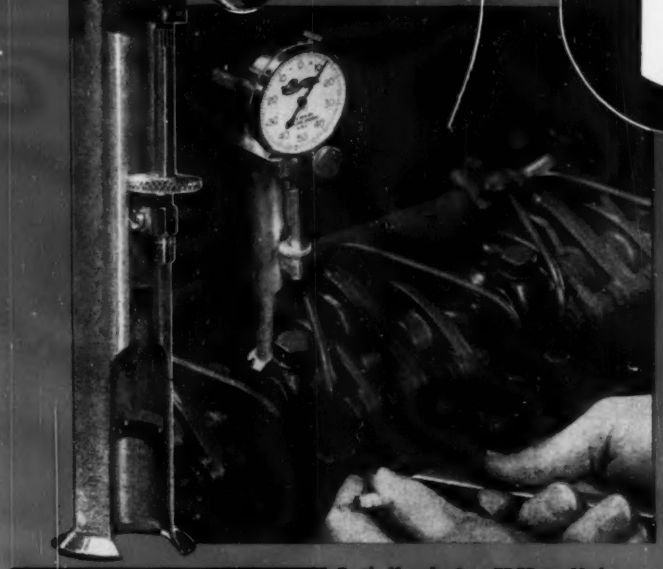
If you are interested in Diesel power plants in public utility, industrial, municipal, water and sewage works; or for mining, oil, pipeline, cotton ginning, ice, or other fields, you can be sure you'll get maximum and dependable power at lowest operating cost with CP Diesel, Gas or Dual-Fuel engines. Available in sizes ranging from 120 HP to 1800 HP, the CP line includes both normally aspirated and supercharged engines. For more information write *Chicago Pneumatic Tool Company, 8 East 44th Street, New York 17, N. Y.*

Chicago Pneumatic

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES • ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

Stop Feeling Your Way!

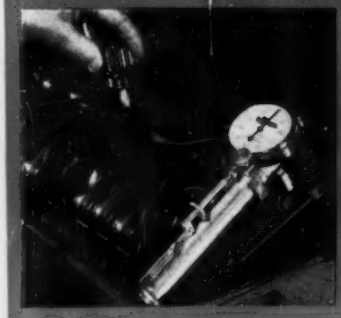
Use the New P&G Valve-Gapper



Both Hands Are FREE to Make Adjustments While Dial Indicator Registers Exact Setting

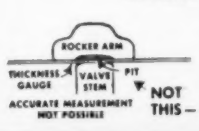
Above: Adjust Valve Gap *Accurately*— Valve-Gapper measures travel of rocker arm prior to contact with valve stem—both hands free to use tools.

Left: Time Fuel Injectors *Visually*—Dial indicator in timing attachment measures exact height of injector follower guide above injector body.



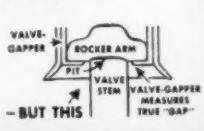
Left: Balance Fuel Injector Racks *Quickly* with Micrometer Accuracy—With the Valve-Gapper positioned between the control tube lever and cylinder head rim, the dial indicator registers the smallest variation in settings as other racks are matched to No. 1.

P&G VALVE-GAPPER 100% Accurate Even When Rocker Arms Are Worn or Pitted



NOT THIS —

The dial indicator registers *exactly* the entire travel of the rocker arm prior to contact with the valve stem, but a feeler gauge blocks-off the pit, making accurate measurement impossible.



— BUT THIS

P&G MANUFACTURING CO.

2262 N. ALBINA AVENUE • PORTLAND 12, OREGON

to ▶SET VALVE GAPS ▶TIME FUEL INJECTORS ▶BALANCE FUEL RACKS

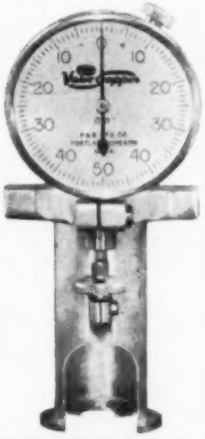
with Micrometer Accuracy on GM DIESEL ENGINES

The Valve-Gapper is a precision instrument, utilizing an entirely new principle to adjust valve clearance, time fuel injectors and balance fuel injector racks. This new principle incorporates a dial indicator which registers the smallest variation in settings, eliminating the inaccuracies inherent in individual "feel".

The model 201 enables GM Diesel engine owners or operators, as well as mechanics to make these adjustments easily, quickly and with *micrometer accuracy.*

There is no departure from GM's recommended procedure—only the method of indication differs.

Model 111 for Gas Engines



Use this model on ALL cars with valve-in-head engines . . . as well as most makes of light trucks and pick-ups.

With the engine idling the dial indicator registers the *exact* clearance *before, during* and *after* adjustment. The Valve-Gapper is easy to use and reduces the time normally required for valve adjustment as much as 50%!

INSTANT LOCATION OF DEFECTIVE HYDRAULIC LIFTERS

Defective or noisy hydraulic lifters can be spotted in the time required to place the Valve-Gapper on each rocker arm.

ORDER FROM YOUR JOBBER OR WRITE P&G MFG. CO.

WRITE TODAY P&G MANUFACTURING CO. Dept. 3D
2262 N. Albina Avenue, Portland 12, Oregon

Please send me Valve-Gapper literature and prices.

Firm Name_____

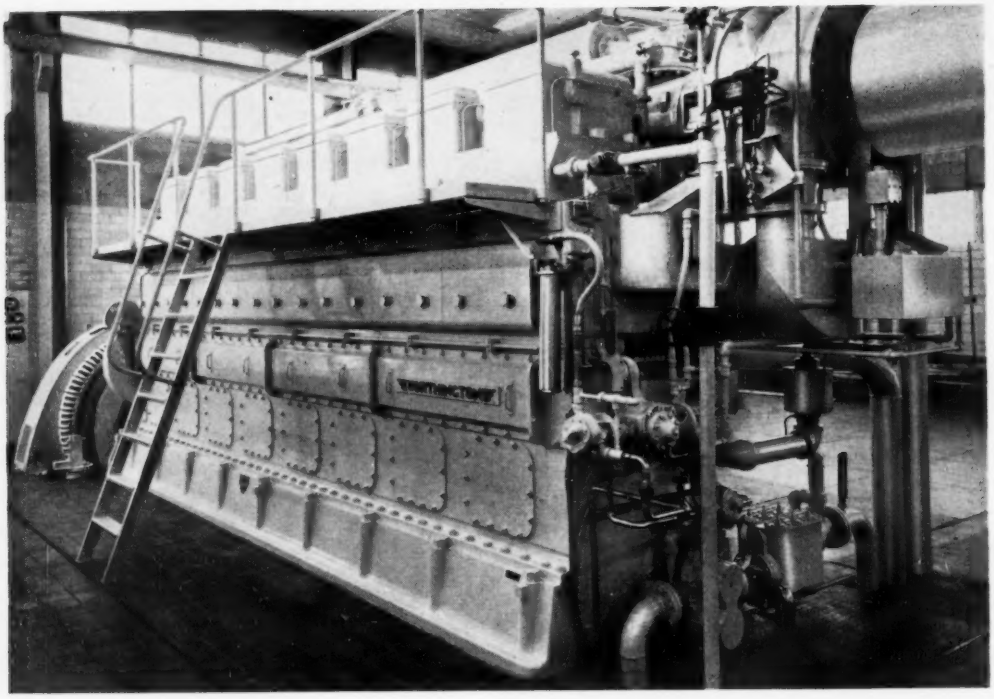
Your Name_____

Address_____

City_____ Zone_____ State_____

Type of Business_____

My (Dealer) (Jobber) is:_____



What's your engine choice?

Worthington has them all:

OIL DIESELS GAS DIESELS GAS SPARK IGNITION DUAL FUEL	*150 to 4,000 hp*

The *dual fuel* engine will operate on any proportion of oil and gas — 5% oil to 95% gas to 100% oil. It's *instantly* convertible from gas to oil.

All types are available in *naturally aspirated* or *turbo-supercharged* designs.

Worthington auxiliary equipment includes: *speed increasing and decreasing gears, evaporative coolers and water circulating pumps for cooling systems, pumps and heaters for fuel handling and treating, lube oil pumps, starting air systems.*

Write for Bulletin S-500-B54 for data on fuel consumption costs for each type of Worthington engine. *Worthington Corporation, Engine Division, Buffalo, N. Y.* E.2.19

Economical Continuous Power

WORTHINGTON

Engines

STRETCH ENGINE WORK HOURS WITH A UNITED OIL BATH AIR CLEANER

United Oil Bath Air Cleaner used on diesel engine powering 20-ton crawler tractor.

You can add hundreds of hours of operation to an engine by installing a United Oil Bath Air Cleaner. Here's why. Efficient United Air Cleaners prevent over 99 percent of airborne dust from entering the engine — protect rings, pistons, sleeve bearings from excessive wear.

Back of United are over 30 years of air cleaner experience. Time-tested United Oil Bath Air Cleaners have proved their worth on thousands of diesel engines used for powering trucks, tractors, road machinery, stationary and portable power units.

Experienced United Specialties sales engineers can help you with up-to-the-minute counsel on problems relating to the design and use of oil bath air cleaners. Write for complete details.

UNITED SPECIALTIES COMPANY

United Air Cleaner Division — Chicago 28 — Mitchell Division — Philadelphia 36 — Birmingham 11, Alabama

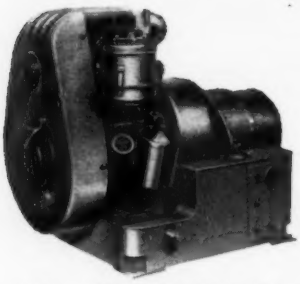
AIR CLEANERS ★ METAL STAMPINGS ★ ROLLED SHAPES
IGNITION AND TURN SIGNAL SWITCHES ★ DOVETAILS

Onan Specifies VANASIL OIL-ABSORBING PISTONS for their DIESEL ENGINES

D. W. Onan & Sons, Inc., are world-famous for their Onan Electric Plants powered by gasoline and Diesel engines. Exhaustive tests by Onan engineers have proved the advantages of VANASIL Pistons to be so outstanding for heavy duty, continuous service, that they have specified Vanasil as original equipment in their air-cooled Diesel engines.

What the Onan Tests Showed:

1. "Better starting characteristics due to much better compression at cranking speeds. Improved control of compression (for both starting and operation) results from the close tolerances possible with VANASIL pistons; clearance being reduced ⅓ (one-third) compared to ordinary aluminum alloy pistons.
2. "Increased power output, due to reduced friction. This increased efficiency results from the Vanasil alloy itself, plus the improved lubrication created by the Vanasil 'oil-absorbing' feature, plus the close tolerance piston fit.



ONAN MODEL 205 DSP 2500 WATTS

"We expect to realize prolonged piston life due to the hardness of Vanasil alloy, which greatly reduces wear on ring grooves and piston pin holes as well as skirts."

D. W. ONAN
& SONS, Inc.

T. G. Valenty, *Design Engineer*

DIESEL or GASOLINE... VANASIL PISTONS ARE "TOPS"

The tough Vanasil Alloy is as light as aluminum—wears like iron. Vanasil reduces top ring groove wear up to 75%—that's why Vanasil pistons have many performance records of 200,000—300,000—400,000 miles of service. Test Vanasil Pistons!—they run better, last longer, cut motor maintenance costs to the bone.

10

VANASIL ADVANTAGES

PATENTED VANADIUM—SILICON—ALUMINUM ALLOY

1. LIGHT WEIGHT—Same as other aluminum alloys.
2. SCORING, SCUFFING MINIMIZED—Because of "Oil-absorbing" microscopic porous texture.
3. LONGER LIFE—30% less friction—30% harder, outwears other aluminum alloys several times.
4. TOP RING—Breakage virtually eliminated because of reduced ring groove wear.
5. LOW EXPANSION—Characteristics of Cast Iron.
6. CLOSE CLEARANCES—Fitted with Cast Iron Clearances.
7. SOLID SKIRT DESIGN—No expansion devices required.
8. HIGH HEAT CONDUCTIVITY—Similar to other aluminum alloys.
9. GRAIN GROWTH—None.
10. PLATING—No tin or other break-in coating required.

VANASIL Piston Warehouse Stocks:

CALIFORNIA—Automotive Equipment Service, 293 26th St., Oakland
COLORADO—Barney Gross Supply Co., 1606-14 Wazee St., Denver
FLORIDA—H & M Parts Warehouse, 1086 W. Adams St., Jacksonville
NEW YORK—Bethlehem Equipment Co., 109 W. 64th St., New York 23

MICRO-X
VANASIL
OIL-ABSORBING
PISTONS

Manufactured by

GILLETT & EATON, INC.

Established 1868

846 DOUGHTY ST. • PHONE: 6201 • LAKE CITY, MINN.

YOUNG DIESEL COOLING RADIATORS...

MEET SEVERE SERVICE REQUIREMENTS

SECTIONAL-TYPE CORE RADIATOR FOR LUBE OIL AND JACKET WATER COOLING

Rugged Young Sectional-type "Mono-Weld" Radiators noted for ease and economy of maintenance, cool the newly-announced Sterling Engine Company Diesel-generating plants built for the United States Navy. These plants were developed in cooperation with the Navy Bureau of Yards and Docks.

These Young "Mono-Welds" provide efficient cooling under severe conditions, withstanding ambient temperatures, in this installation, varying from 0° F., to 125° F., under constant exposure to solar radiation . . . and, they resist rigors of travel over rough terrain at speeds up to 35 mph!

Young one-piece and sectional-type Radiators serve stationary, portable and stand-by power plants, in oil-field pipeline compressor and booster stations . . . in heavy industrial, municipal, and chemical process installations. Capacities for rejecting heat range from 70,000 to 3,250,000 Btu per hour. For further information, see your Young Representative listed in the yellow pages of the telephone book, or write direct.

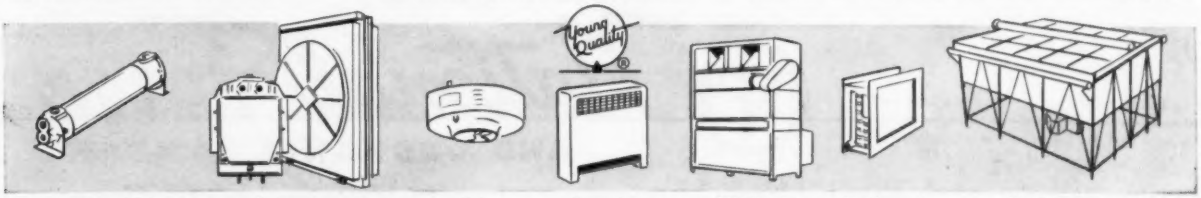
Write for further details or catalogs, without obligation.

Heat Transfer Products for Automotive, Agricultural, Industrial, Gas and Diesel Engine Application.

YOUNG

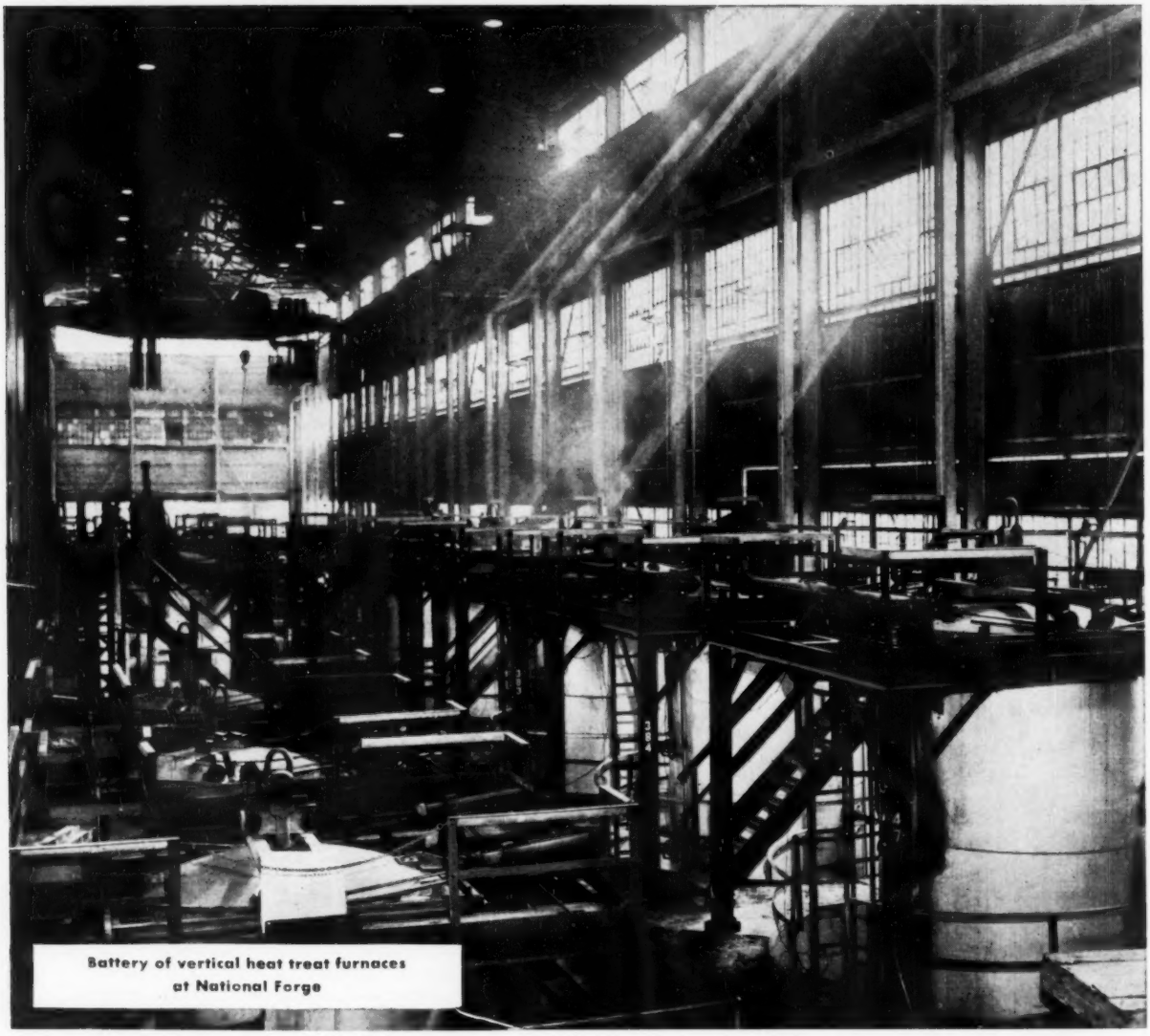
Heating, Cooling, Air Conditioning Products for Home and Industry.

YOUNG RADIATOR COMPANY DEPT. 414-D, RACINE, WISCONSIN • PLANTS AT RACINE, WIS. AND MATTOON, ILL.



Shell and Tube Heat Exchangers | Automotive and Industrial Radiators | Unit Heaters | Convector Radiators | "YAC" Air Conditioners | Heating and Cooling Coils | "HC" Cooling and Condensing Units

Correct Heat Treat Procedure Is Essential to Successful Forgings



Battery of vertical heat treat furnaces at National Forge

National Forge metallurgical department specifies heat treat cycles for your forging based on its analysis, size and shape. The maximum physical characteristics are brought out during this process. That's why it's essential to select just the right cycle and to maintain a continuous check on your forging's progress — National Forge are expert in these procedures.

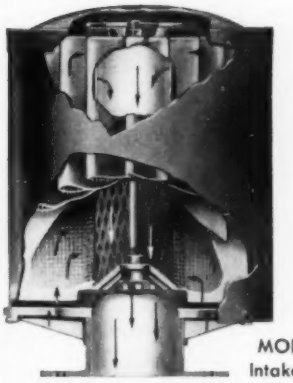
National Forge heat treating facilities are complete and of large capacity: horizontal annealing furnaces, vertical furnaces (shown in illustration) with capacities for forgings up to 55 feet in length, flame hardening with work capacity of 24 inch diameter x 21 feet long and nitriding furnaces that can accommodate 14 foot long forgings.

When your forgings are National-Forged, you can be sure they're produced with the best equipment handled by experts skilled in each operation from producing the electric steel, forging, heat treating to finish machining...all under one control. For the next forging you need *Try National Forge.* Write:

STEEL MAKERS ☆ FORGESMITHS
HEAT TREATERS ☆ MACHINISTS

NF National Forge
AND ORDNANCE COMPANY
Irvine, Warren County, Pennsylvania

BEST ENGINE PROTECTION MONEY CAN BUY!



MODEL D
Intake Filter

STAYNEW INTAKE FILTERS

STAYNEW INTAKE FILTERS keep shutdowns and repairs at an absolute minimum. Industrial engineers everywhere know that Staynew's *positive protection* lengthens engine life. They may cost more than ordinary intake filters, but with Staynew, you're assured of engines operating at top performance years longer. Staynew Intake Filters' extreme efficiency protects vital engine parts without carefully held maintenance schedules. And, efficiency actually increases with use. They're efficient over a wide range of loads, not affected by temperature changes, there's no oil carry over and no oil blow-out on free air unloading compressors. To keep equipment young *longer*, always specify Staynew.

Write today for Intake Filter Bulletin S.I.F.

Representatives in Principal Cities

DOLLINGER PROTECTOMOTOR STAYNEW FILTERS

DOLLINGER
CORPORATION

10 Centre Park Rochester 3, N. Y.

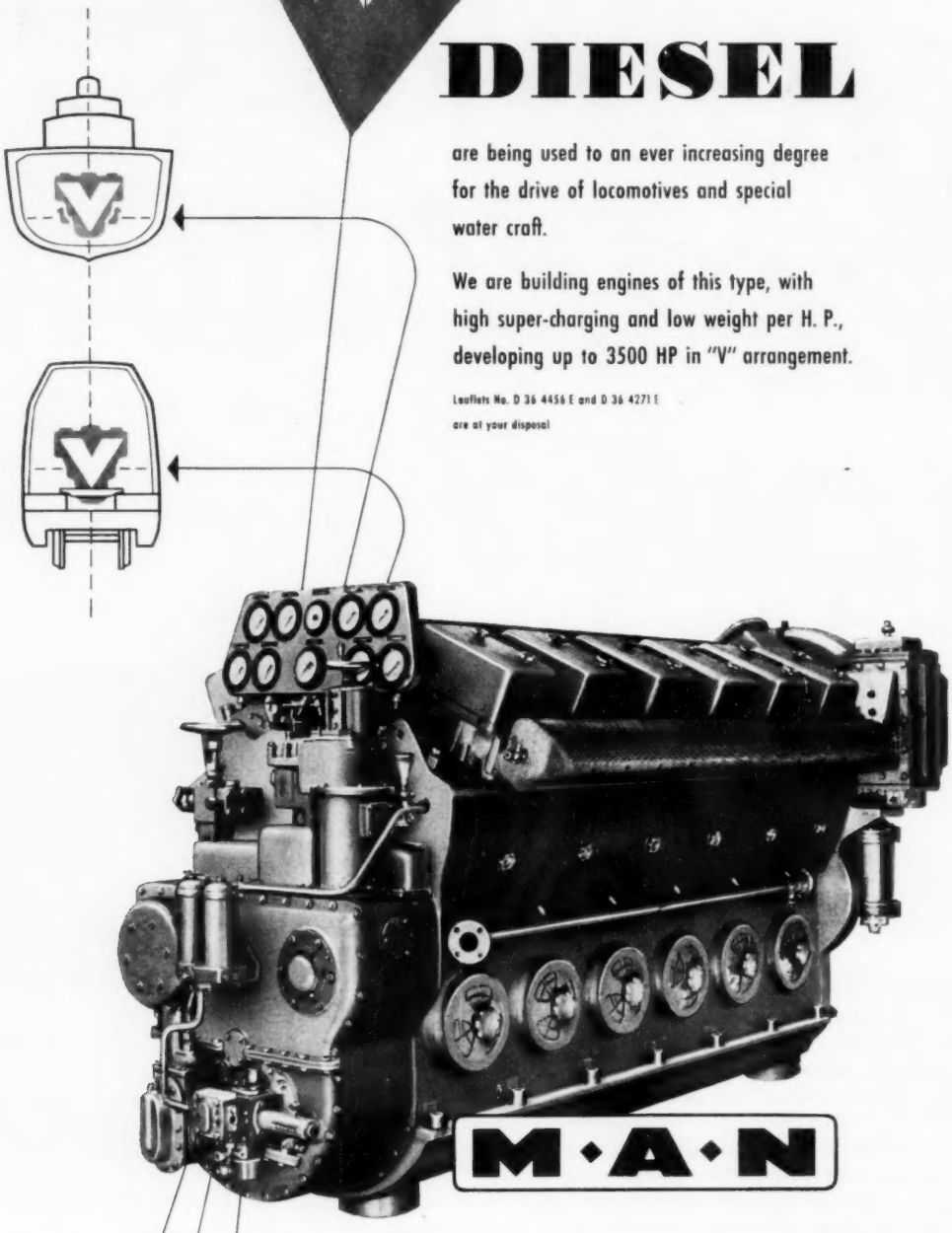
ALL TYPES OF FILTERS
FOR EVERY INDUSTRIAL NEED

V DIESEL

are being used to an ever increasing degree for the drive of locomotives and special water craft.

We are building engines of this type, with high super-charging and low weight per H. P., developing up to 3500 HP in "V" arrangement.

Leaflets No. D 36 4456 E and D 36 4271 E are at your disposal

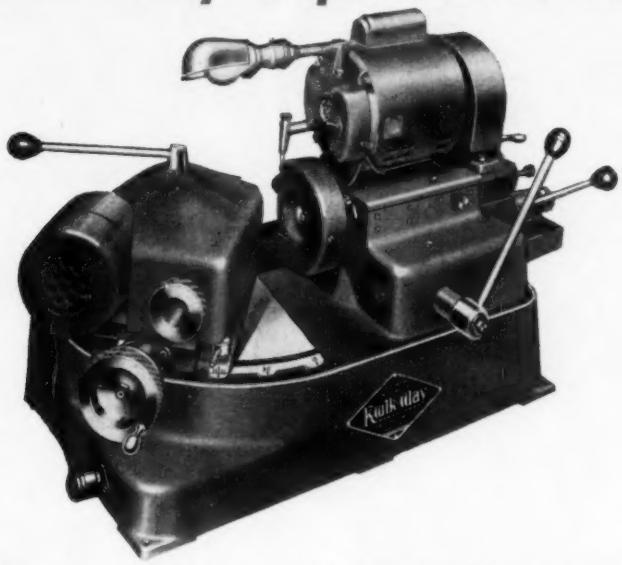


MASCHINENFABRIK AUGSBURG-NÜRNBERG AG · WERK AUGSBURG

Amazing, new

VALVE FACING MACHINE

the Kwik-Way Super-Matic for 1954



This outstanding new valve facing machine makes it easy to obtain extreme accuracy and superior finish, with smooth simplified operation. For perfect valve facing work, the answer is Kwik-Way's Super-Matic for 1954.

- **extreme accuracy**
- **superior finish**
- **smooth, easy operation**
- **Micro-switch operating controls**
- **precision built, lever operated, 6-ball compound chuck**
- **chuck capacity 7/32" to 5/8"**
- **improved coolant system**
- **extra power with dual motors**
- **dove-tailed, handscraped ways with adjustable gib**
- **pre-lubricated, sealed bearings on grinder spindle**
- **rugged construction. Built to highest standards for fine machine tools.**

See and operate the Super-Matic in your shop. No obligation. Call your Kwik-Way representative for a free demonstration.

MAIL THIS COUPON TODAY

Kwik-Way

Serving the Motor Rebuilding Industry Since 1920

VALVE FACING MACHINES • VALVE SEAT GRINDERS • VALVE SEAT INSERT TOOLS • VORTEX SUCTION DEVICE CYLINDER BORING MACHINES • LINE BORING MACHINES • PISTON CAM TURNING AND GRINDING MACHINES.

CEDAR RAPIDS ENGINEERING CO.
918 17th St., N.E., Cedar Rapids, Iowa

Tell me more about this remarkable new valve facing machine.

☐ Send literature.
☐ Have your representative come in and demonstrate the Super-Matic--at no cost or obligation.

Name_____

Company_____

Street_____

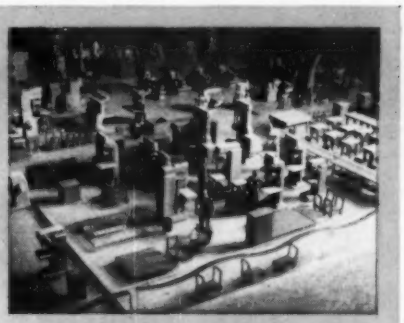
City_____ State_____

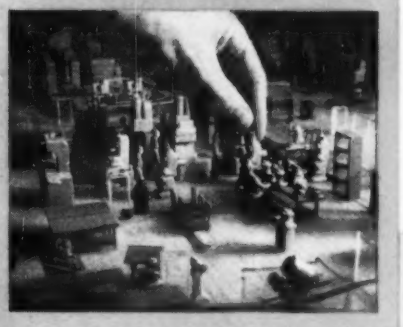
SINCE 1864
DEUTZ
Diesel
3-1800 H.P. air- and water-cooled
for Road vehicles, Rail vehicles,
Watercraft, Working machines •
Marine engines also direct reversing
for all waterways • Diesel-trac-
tors 11 · 15 · 30 · 45 · 60
H.P. Diesel-locomoti-
ves • Generator sets
air- and water-cooled
for lighting current
and power stations
stationary and mobile
KLÖCKNER-HUMBOLDT-DEUTZ AG · KÖLN
Germany

FACTS ABOUT

ENGINE AND AIRPLANE CORPORATION
FAIRCHILD
Engine Division

PRODUCTION ENGINEERING





3-D . . . in miniature . . . has an important production engineering role at the Fairchild Engine Division. Scaled-down duplicates of the big production lines save countless dollars and untold man hours . . . make possible complete pre-planning before actual production of turbojet engines, auxiliary powerplants and other power products begin.

Miles of blueprints for new floor plans are eliminated. Instead, technicians simply arrange scale models to arrive at the most efficient production layout. Then, actual plant layout is set up to agree with the scale layout. Advanced techniques like this are a part of *planned* production engineering at Fairchild . . . pushing efficiency up and costs down on major projects for *all* the Armed Services.

ENGINE AND AIRPLANE CORPORATION
FAIRCHILD
Engine Division
FARMINGDALE, N. Y.

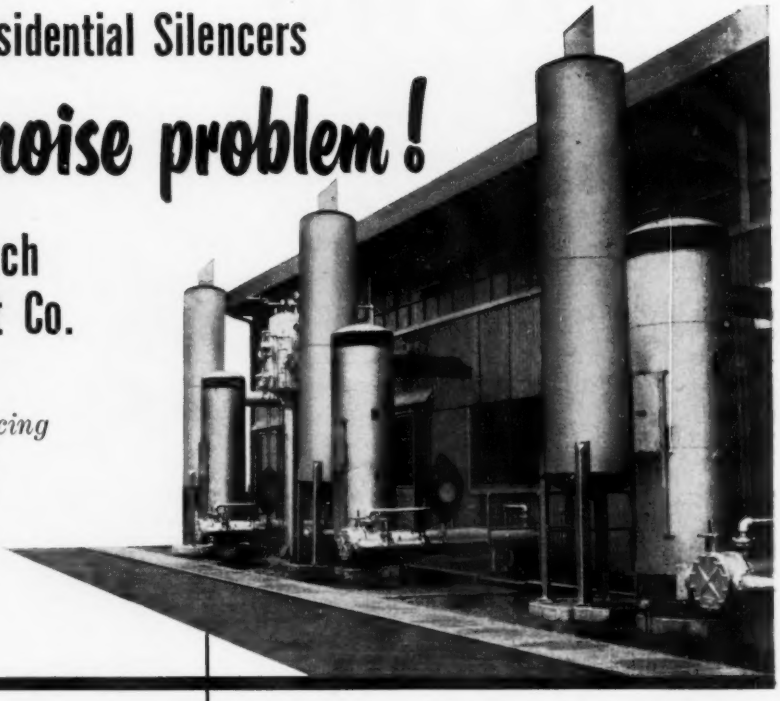
AIRCRAFT DIVISION, Hagerstown, Maryland • GUIDED MISSILES DIVISION, Wyandanch, N. Y.
SPEED CONTROL DIVISION, Wickliffe, Ohio • STRATOS DIVISION, Bay Shore, N. Y.
AL-FIN DIVISION, Farmingdale, N. Y.

Kittell ECS-16 Residential Silencers

lick tough noise problem!

for Long Beach Oil Development Co.

Provide extreme silencing without reducing engine efficiency; prevent complaints from nearby residential area



When the Long Beach Oil Development Company built this recycling plant recently for the City of Long Beach, silencing the three Clark RA5 gas engines held top priority.

The plant is located close to the water's edge, directly across the bay from a large residential area. Since there are no natural obstructions to reduce the noise, good neighbor relations demanded maximum silencing of the exhaust gases.

To solve the problem, Kittell engineers recommended that each engine be equipped with a Kittell ECS-16, four-chamber residential-type silencer, modified for side inlet and equipped with mounting legs as shown above. These highly-efficient units were developed specifically for use near residential, hospital or other areas where extreme silencing is required. To date, not a single complaint of noise has been received.

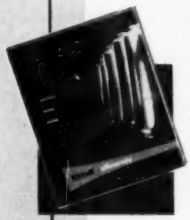
ENTIRELY DIFFERENT DESIGN PRINCIPLE USED! As in all Kittell Silencers, the ECS-16 uses a unique method to control, and thus silence, hot exhaust gases. Kinetic energy in the moving mass of air guides the gases through a series of louvres, smoothing out the pulsations and producing a whisper-quiet flow. A special perforated tube quickly bleeds off the hot bursts as they enter the silencer, eliminating loss of power due to atmospheric back surge.

LONG LIFE; LOW MAINTENANCE! Large, free-flowing passages prevent plugging due to excessive carbon or sludge deposits. This feature and the rugged, heavy steel, all-welded construction, assure long life with minimum maintenance.

IMMEDIATE DELIVERY! Standard models of all Kittell Silencers are quickly available for all types of engines. Write today for your copy of the Kittell catalog. It's free!

There's a Kittell Silencer and Spark Arrestor for every requirement—big or small!

- Gas and diesel engines
- Steam generators
- Drilling rigs
- Pumping units
- Generator sets
- Compressors and blowers
- Boats and ships
- Heavy construction equipment
- Trucks and buses
- Logging and mining machinery



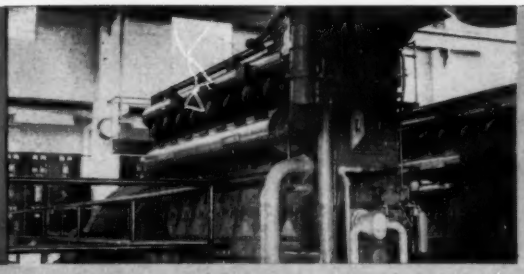
SPECIAL PURPOSE SILENCERS! Stainless steel, ceramic coated, and other special purpose silencing equipment can also be supplied. Prices and delivery quoted to your specifications.

"15 years of silencer engineering and fabricating experience"

Kittell Muffler & Engineering Inc.

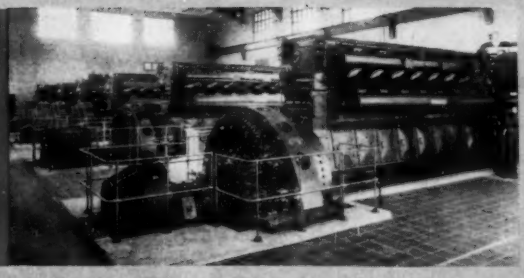
915 South Santa Fe Avenue • Los Angeles 21, California

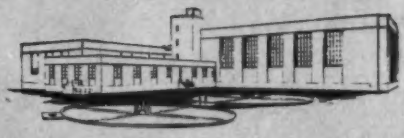
POWER GENERATING



One of four Superior Diesels which provide power for the city of Petosky, Michigan.

SEWAGE DISPOSAL

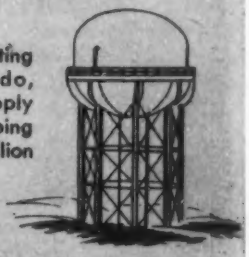




Six, Model 80, dual-fuel Superior Engines operating on sewage gas, provide power for all plant equipment when pumping 160 million gallons daily at New York City's Owl's Head Sewage Treatment Plant.

WATER SUPPLY PUMPING

Standby generating plant for Toledo, Ohio water supply system with pumping capacity of 80 million gallons daily.



with SUPERIOR DIESELS

Installations of Superior and Atlas Diesels serve municipal power needs throughout the U.S.A. and in many other parts of the world. These applications are typical of the many ways in which Superior and Atlas Engines are utilized. Records kept by users of these efficient engines point up the economy and dependability of Superior and Atlas Diesels for all kinds of municipal power needs—both continuous and standby.

New bulletins describing the complete line of diesel, dual-fuel, and gas engines are now available. For specific information on the proper type of equipment for any purpose, write Springfield for the name of the Engine Division Representative in your territory.

DIESEL DUAL FUEL GAS — THE NATIONAL SUPPLY COMPANY — ATLAS Imperial DIESEL ENGINES — Superior ENGINES — DISTRIBUTOR OF Lister DIESELS IN U.S.A.

THE NATIONAL SUPPLY COMPANY

ENGINE DIVISION PLANT AND GENERAL OFFICES: SPRINGFIELD, OHIO

SALES AND SERVICE POINTS: Gloucester, Massachusetts • Houston, Texas • Fort Worth, Texas • San Diego, California Oakland, California • Terminal Island, California • Ketchikan, Alaska • Washington, D.C. • Chicago, Illinois • Portland, Oregon • Astoria, Oregon • Casper, Wyoming • Halifax, Nova Scotia • Vancouver, B.C. • Toronto, Ontario • Park Rapids, Minnesota • New York, New York • Seattle, Washington • New Orleans, Louisiana • Pittsburgh, Pennsylvania

"For over twelve years, the U.S. Rubber Company..."

HARRY E. HUMPHREYS, Jr.
President,
United States Rubber Company

"For over twelve years the United States Rubber Company has offered its employees the Payroll Savings Plan, whereby they can systematically and regularly save in United States Savings Bonds. Over those years, tens of thousands of our employees have joined the Payroll Savings Plan with direct benefits to themselves and their families. Such employees are better employees because with more personal security and freedom from economic worry, there is less absenteeism and personnel turnover, fewer accidents and greater employee responsibility. Such regular investment in Bonds contributes also to the economic strength of the nation. By thus promoting a sounder dollar, business also directly benefits itself. That's why we at United States Rubber endorse the Payroll Savings Plan for Savings Bonds."

Mr. Humphreys cites three important benefits of the Payroll Savings Plan: Payroll Savers build personal security ... production curves reflect serious-minded workers and reduced absenteeism ... the national economy is strengthened by a growing reservoir of future purchasing power—more than 49 billion dollars in U. S. Savings Bonds, *cash value*, held by individuals.

There is still another big advantage in the Payroll Savings Plan: it is easy to install and maintain.

If you do not have the Payroll Savings Plan, or if you have the Plan and your employee participation is less than 60%, here's all you have to do to help your employees, your company and the country:

Write today to Savings Bond Division, U. S. Treasury Department, Washington, D. C. Tell them you want to join the United States Rubber Company and the 45,000 other companies that are making an important contribution to national security and a sounder dollar.

Your State Director, U. S. Savings Bond Division, will contact you promptly. He will explain the simple procedure of installing the Plan and will show you how to conduct a simple, person-to-person canvass that will put a Payroll Savings Application Blank in the hands of every man and woman in your plant and offices.

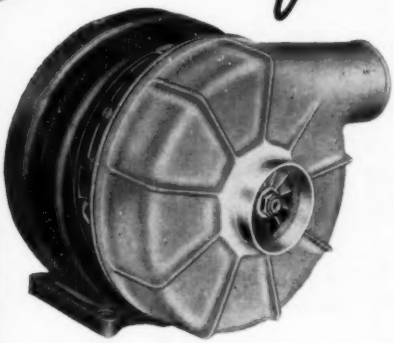
That's all you have to do. Your employees will do the rest. They are as interested in their own future as you are in yours. Give them an opportunity to build personal security for themselves and a better America for their children.

The United States Government does not pay for this advertising. The Treasury Department thanks, for their patriotic donation, the Advertising Council and

DIESEL POWER

USE SCHWITZER-CUMMINS DIESEL ENGINE EQUIPMENT

for Greater Operating Economy



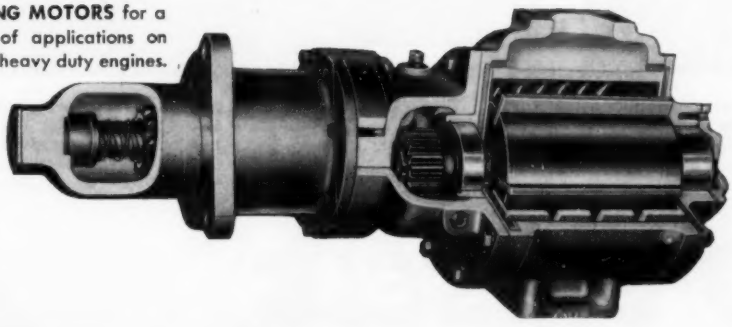
EXHAUST DRIVEN TURBOCHARGERS for engines from 70 to 200 HP.

All of our products for your Diesel engines are engineered for your particular application and requirements. More than one-third of a century of research, intensive engineering, broad field experience with unexcelled manufacturing facilities are back of our products. We gladly offer our engineering assistance and our extensive facilities to produce and serve you efficiently.

THERMOSTATICALLY CONTROLLED COOLING FANS AND FAN DRIVES. Available for installation by owner on many makes and sizes of heavy duty engines.

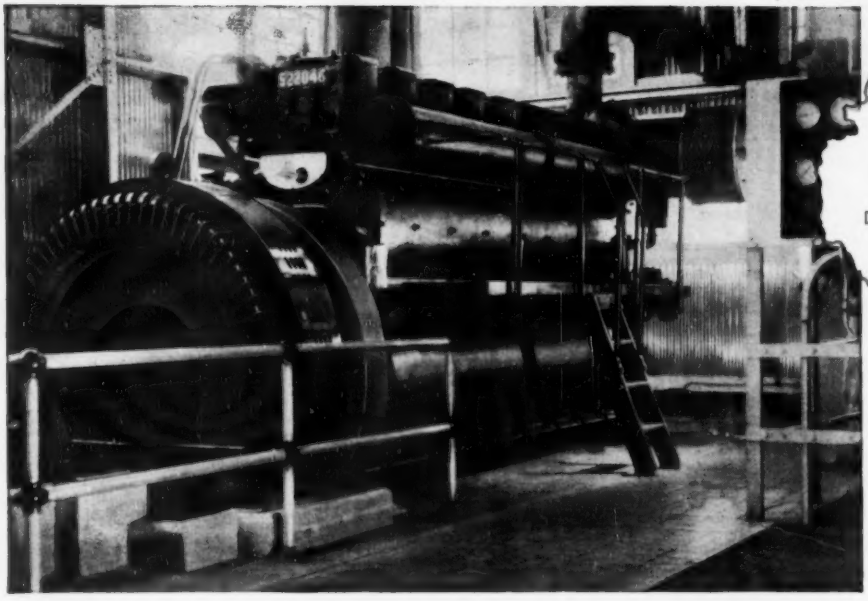
POSITIVE DISPLACEMENT SUPERCHARGERS for engine sizes from 50 to 500 HP and pressure ratios of 2:1 max.

AIR STARTING MOTORS for a wide range of applications on many sizes of heavy duty engines.



- COOLING FANS
- OIL PUMPS
- WATER PUMPS
- CRANKSHAFT VIBRATION DAMPERS
- AUTOMATIC SHAFT SEALS
- PUMPS FOR AUTOMATIC TRANSMISSIONS AND POWER STEERING

SCHWITZER-CUMMINS COMPANY
1125 MASSACHUSETTS AVENUE
INDIANAPOLIS 7, INDIANA, U.S.A.



this eight-cylinder, 1080-hp Alco Diesel Engine delivers dependable, round-the-clock power to a large bauxite mining center and its community.

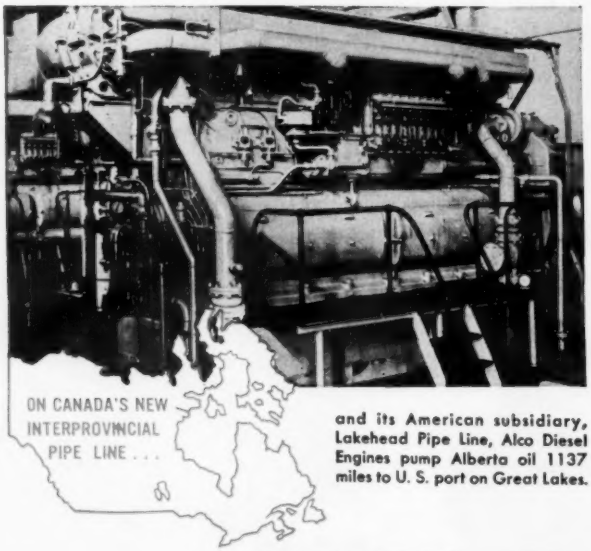
THE STORY GETS AROUND

Make a better product and the story gets around.

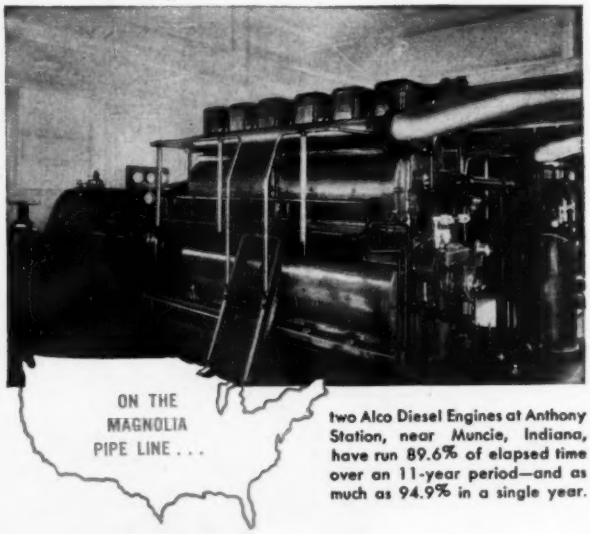
The story of Alco Diesel Engines, for example, has traveled around the entire world—right along with the engines themselves. High points in the story are:

- ☆ **COMPACT DESIGN—saves floor space, cuts construction costs.**
- ☆ **HIGH ENGINE EFFICIENCY—for lower fuel costs.**
- ☆ **FLEXIBLE POWER RANGE—for lower expansion costs.**
- ☆ **MEDIUM SPEED—for lower auxiliary equipment costs.**
- ☆ **HANDLES ANY TYPE OF JOB—continuous or standby, temporary or permanent.**

Your nearest Alco sales representative will be happy to give you complete details. (For information on the new, heavy-duty lightweight Model 251A, ask for Bulletin DE-2.) Sales offices in New York, Beaumont, Chicago, Cleveland, Houston, Kansas City, San Francisco, Schenectady and St. Louis.



and its American subsidiary, Lakehead Pipe Line, Alco Diesel Engines pump Alberta oil 1137 miles to U. S. port on Great Lakes.

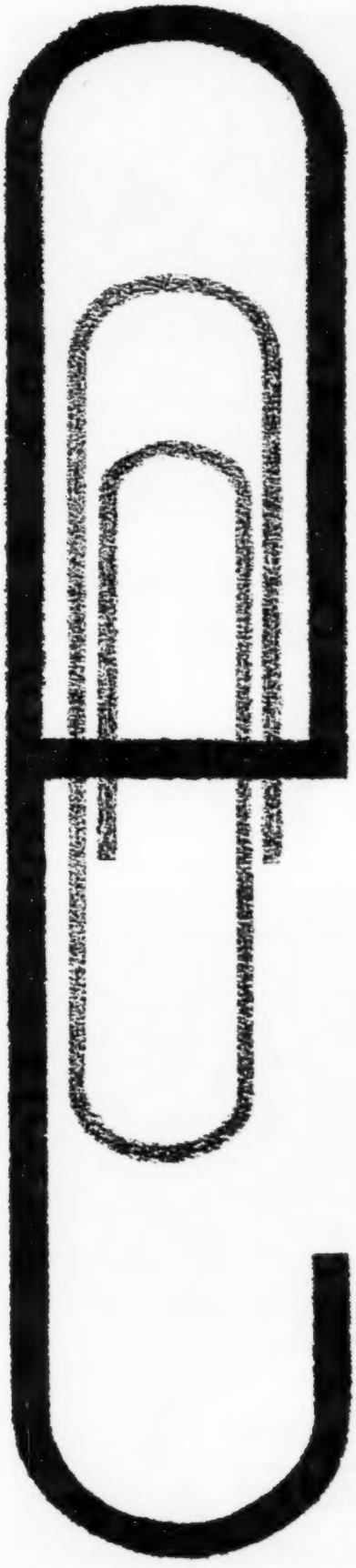


two Alco Diesel Engines at Anthony Station, near Muncie, Indiana, have run 89.6% of elapsed time over an 11-year period—and as much as 94.9% in a single year.

ALCO DIESELS

AMERICAN LOCOMOTIVE COMPANY

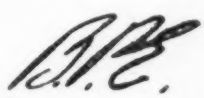
SCHENECTADY, N. Y.



editorially speaking

Conservation or Conversation?

Remember the CMP days? Material shortages were the "hair shirt" worn by most manufacturers. Some shortages resulted from maldistribution or just plain snafu; some were painfully real. Decontrol did not increase the supply; it only meant that the immediate squeeze was over. We had and still have materials that are strategic, critical, or temporarily in short supply. The vital ingredients used in the metallurgist's magic always seems to come from far away where there is chronically an economic or political crisis. Also, some of our resources are being depleted. It adds up to longrange limited availability of certain materials. In this area, we are a "have not" nation. Certain governmental agencies are aware of this and are trying to dispel our traditional "inexhaustible supply" complex. We saw a pointed government film on the subject. DMS is planning and keeping some of the machinery oiled, just in case. Also, being an old Engineer Corps man, we were interested in details of their program for conservation of critical materials. Procedures are now set up for procurement personnel to encourage suppliers to redesign using alternate and substitute materials that are less- or non-critical. The story we get is that they won't quibble on specifications as long as the performance is there—quite a concession. But at present there are no teeth in any of this, so what is the incentive? Simply that it is good business. Imaginative design now, using materials with a broad supply base, could mean the difference between delivery and non-delivery if the squeeze was put on again. Crash programs are murder. And who can tell? You might come up with something better and cheaper. Which will it be—conservation or conversation?



Cyclan is tough,
with
plenty of tension,
but not brittle

No other piston ring material combines so many advantages as

Cyclan

- Cyclan is Sealed Power's new alloy for extreme operating conditions.
- Cyclan's strength approaches that of steel.
- Cyclan's resilience exceeds that of cast iron.
- Cyclan retains the bearing characteristics of cast iron.
- Cyclan has extra high impact value for resisting shock.
- Cyclan rings retain their true shape even after considerable deflection.
- Cyclan piston rings are especially durable in super-charged engines.
- Cyclan can be readily chrome-plated, but functions efficiently without plating.
- Cyclan is available for original equipment rings in heavy duty engines.
- Some Sealed Power Cyclan Ring Sets are available for replacement use now. Others will follow soon.

Let our engineers tell you the Cyclan story!

SEALED POWER
CORPORATION,
MUSKEGON, MICHIGAN

Sealed Power
PISTON RINGS · PISTONS
CYLINDER SLEEVES

highlights

- During the first two months of 1954, Class I railroads placed 239 diesel-electric locomotive units in service.

- Industrial Exposition of the American Society of Tool Engineers will be held in the Convention Center, Philadelphia, Pennsylvania from April 26 to 30, 1954.

- Hot Springs, Virginia will be the site of the spring meeting of the Compressed Air and Gas Institute from May 10 to 12, 1954. The place—The Homestead.

- Chicago's International Amphitheatre will be the scene of the 3-day Basic Materials Conference which commences on May 17, 1954.

- El Paso Natural Gas Company has received FPC authorization to install two additional 1320-hp compressor units at its Spraberry station.

- During 1953, the Union Pacific Railroad added 114 diesel-electric locomotives to its fleet.

- The conversion of steam-powered locomotive track cranes to diesel power has in several cases resulted in fuel bill cuts from $800 to $150 per month, according to Link-Belt and Cummins.

- A GE diesel-electric locomotive recently went underground—to work in a New Mexico potash mine.

- EMD recently delivered its 15,000th locomotive to the Union Pacific Railroad in ceremonies at Union Station, Omaha, Nebraska.

- Spring meeting of the American Welding Society is scheduled for the Statler Hotel in Buffalo, New York—May 4 to 17, 1954.

- According to GM, the pressures developed in a Unit Injector are equal to pressures found 12 miles below the surface of the sea—approximately 30,000 lbs.

- The Naval Research Laboratory is currently conducting a basic study of how fuels burn, in an effort to make more efficient use of existing fuels as well as developing fuels with improved ignition characteristics.

- Diesel locomotives have in many cases produced annual savings of 20 to 30 per cent on their initial cost, making them one of the best capital investments, according to API.

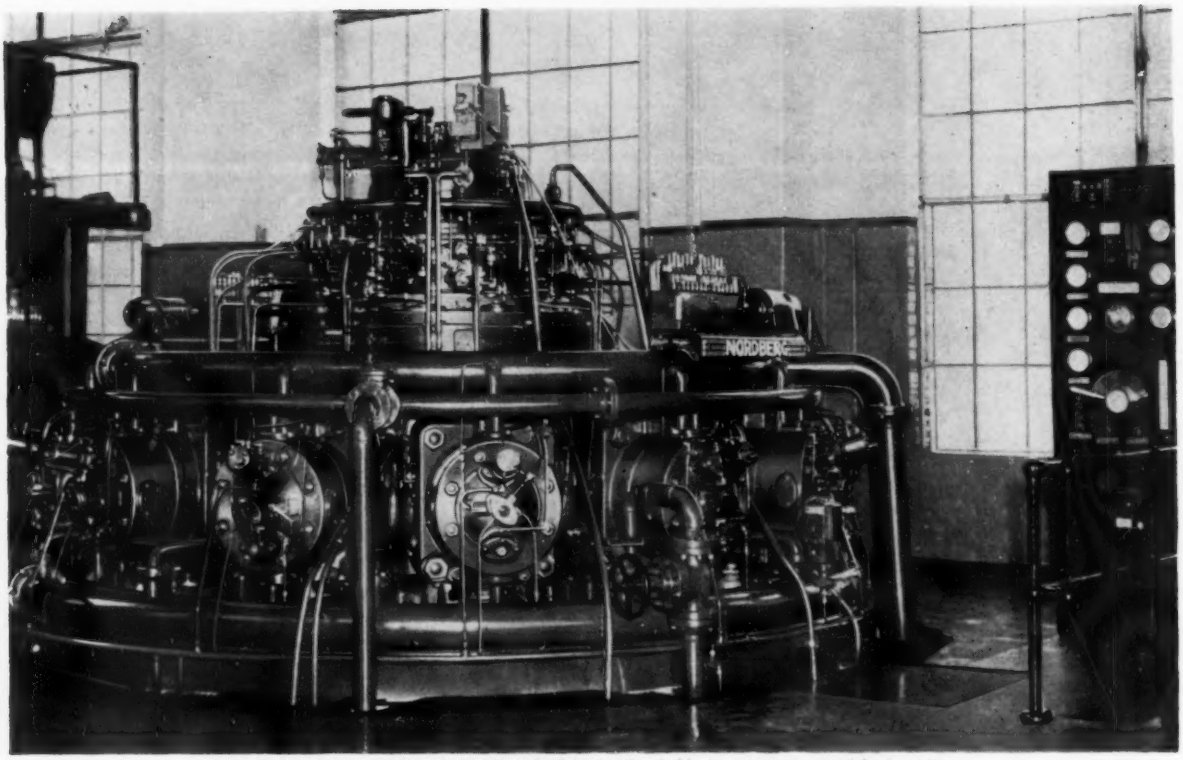
- The Transcontinental Gas Pipe Line Corp. is seeking FPC authorization to expand facilities. The new construction would include 421 miles of line and 15,600 hp installed in new and existing compressor stations.

- A single-engine Cessna L-19, powered by a Boeing 502 gas turbine, recently broke the world altitude record for light planes when it attained an altitude of 37,063 ft.

- It was recently reported that British railways have started to build up a diesel railcar fleet. The program, placing 67 two-car units on six selected routes, British Railways state, will afford greater economy and flexibility of operation.

- Lubrication Committee of the American Petroleum Institute will meet at Skytop Lodge, Skytop, Pennsylvania from May 3 to 5, 1954.

- The average speed of freight trains in 1953 was greater than in any preceding year, according to AAR. More freight cars per train were also handled during 1953. With more railroads reaching complete dieselization, the 1954 figure will probably be higher still.



Fredonia's latest addition is the first dual-fuel unit of this type to enter municipal service.

A "First" for Fredonia

By G. W. Otto, Superintendent and Engineer

More generation capacity in the form of a dual-fuel engine — first of this type to enter municipal service — shows prospect of cutting power generation costs while also solving a space problem.

FOR almost 30 years, Fredonia's municipal power plant has been supplying power at rates well below average. As part of the city's program to maintain this efficiency, Fredonia recently completed the installation of a Nordberg 2-cycle, 12-cyl radial engine equipped with a 1500-kw generator. This engine operates on the dual-fuel principle and is the first of this type to enter commercial service.

Favorable rates undoubtedly have encouraged business and promoted the expansion of residential consumption. Since 1924, Fredonia has owned and operated its light and power plant with air-injection engines, using a cleaned, low-gravity crude to supply power. In 1948, a 900-kw Nordberg 6-cyl dual-fuel engine was installed to supplement the power from the older engines. This engine has operated satisfactorily on dual-fuel with a resultant reduction in plant fuel costs of over $1000. per month.

Although supplementary power is available from an outside source, a short distance from the town at attractive rates, the city commissioners decided to stay in the power business and increase plant output.

Installation space was a critical problem, since all generating positions were filled. It was decided to remove one of the original engines, a 3-cyl air-injection unit, and utilize the space for locating the new unit. However, this space was too limited to install a 1500-kw, low-speed, in-line type engine. Therefore, the Nordberg radial engine was considered. It was found that this engine could be easily installed in this available space.

Engine and Equipment

After preliminary adjustments, the engine went on the line November 9, 1953. Since then, it has been down only a few hours to check alarm systems and automatic control devices. This new engine is similar in construction to the 274 spark-fired engines installed by the Aluminum Company of America and Kaiser Aluminum in their southern reduction works. It is, however, of the dual-fuel type, having 12 cyl of 14-in bore and 16-in stroke operating at 400 rpm.

From the very beginning, this Nordberg engine has operated very satisfactorily on dual fuel. The cost of high-quality natural gas (1040 Btu per cu ft LHV) is relatively

cheap (20 cents per M cu ft). Pilot fuel oil of 19,000 Btu per lb (HHV), is available at our plant for 9 cents per gal. This will result in an overall average unit fuel cost far below that of our 20- to 29-year-old air-injection engines.

The engine-generator foundation required only 27 cu yd of reinforced concrete, which is a small foundation considering the power output of the engine.

The much publicized radial engine now utilizes its sub-base to house a recently designed gear housing. This gear arrangement is engine-driven and operates the lube oil pump, jacket water pump, raw water pump, scavenging air blower, and the exciter, making an unusually compact arrangement of auxiliaries.

A closed cooling system is employed in this installation to control the engine temperature and scale deposits, even though the raw water in the spray pond is treated.

Scavenging air is automatically throttled by means of a thermally controlled butterfly valve operated by a pneumatic motor. This arrangement is designed to permit higher efficiency at partial loads.

Lube oil is cleaned by two full-flow purifiers using cellulose type filters. The auxiliary lube oil pump is used before and after service. This same pump is also automatically controlled while the engine is running and will start if the engine lube oil pump should fail.

A central control and instrument panel was specified and furnished, which included starting and indicating lights, flush-mounted dial-type pressure gauges, exhaust pyrometer, crankcase manometer, alarm panel, remote control pushbuttons with lights for fuel oil pump, and actuator oil pump barring gear switch and load limit control.

The air intake filtering system employs circulating water and oil for summer operation. For winter use, oil only is used as a cleaner. This method of cooling and cleaning reduces air temperatures considerably in warm weather.

A radiator-type intercooler is installed after the scavenging air blower to cool the intake air in summer. Water from the raw water pump is used for the cooling agent.

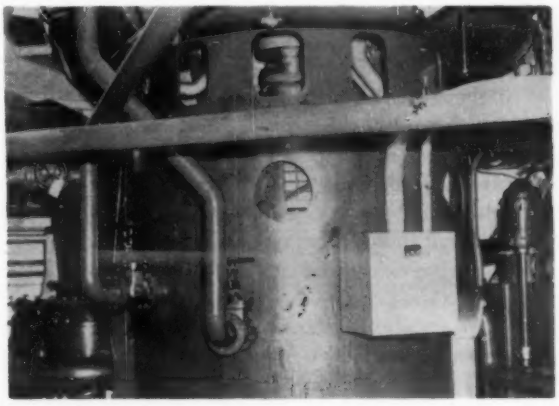
Summing Up

With the exception of a $75,000 revenue bond issue used to supplement cash on hand, Fredonia does not have any outstanding indebtedness against its power and light plant. The cash on hand at the time of the engine purchase was an accumulation of net revenues collected. In addition, moneys were transferred from light plant earnings to augment other city funds whose principal source of revenue is from taxation.

The power and light is furnished and maintained by the light department, free of any charges to the municipally owned water plant, sewage disposal plant, street lighting, fire department, office, cemetery, shops, police department, library, parks, and ball park.

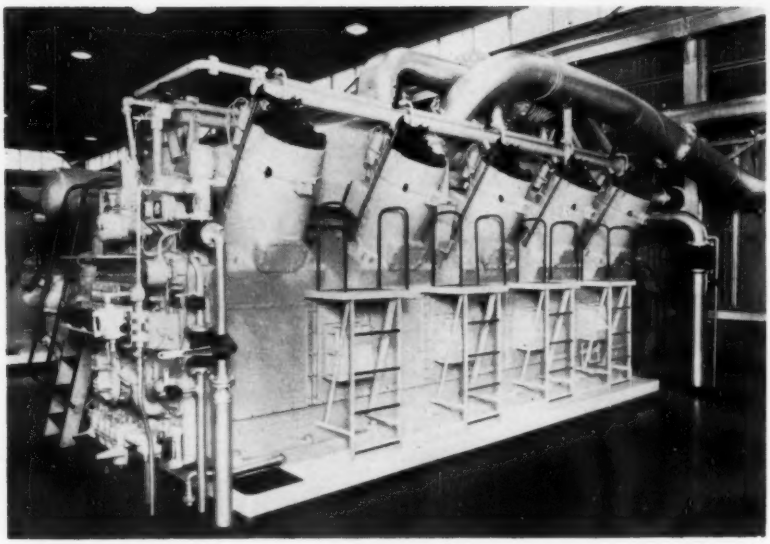
Principal Equipment—Radial Engine

Engine	Nordberg Mfg. Co.
Generator and Exciter	Ideal Electric Co.
Governor	Marquette Metal Products Co.
Jacket water and Lube oil cooler	Graham Mfg. Co., Inc.
Intercooler (scavenging air)	Young Radiator Co.
Intake air cooler	American Air Filter Co.
Intake air cleaner	American Air Filter Co.
Lube oil purifier	Winslow Engineering Co.
Fuel oil strainer	Wm. Nugent Co.
Muffler	Burgess-Manning Co.
Aux. lube oil pump	DeLaval Steam Turbine Co.
Instrumentation	
Instrument panel	Nordberg Mfg. Co.
Alarm system	Viking Instruments, Inc.
Switchgear	General Electric



A rear view of the plant (left) showing the exhaust muffler and intake air filter. Above, is the sub-base of the radial engine which houses the 1500-kw generator. Foundation for the unit is comparatively small, requiring only 27 yards of concrete.

Turbocharging the Two-Cycle Gas Engine



The author, vice president and chief engineer, The Cooper-Bessemer Corporation, states the views of his company on this timely and interesting subject.

By R. L. Boyer

One of the GMV-10 turbocharged angle compressors installed in the field.

THIS is a brief report of experiences and opinions on the turbocharged 2-cycle gas engine as we see it at Cooper-Bessemer. Since we put the first such engine in operation in the field, we have received many requests to prepare papers or write articles regarding our experiences, but have hesitated and still hesitate to put our experiences and opinions on paper. We have learned many times that written statements on such developments are frequently obsolete before they are printed. For the records, this article is written March 1, 1954.

We started turbocharging 2-cycle engines experimentally more than three years ago after studying the possibilities for several years before that. It was certainly logical that we should give every consideration to the problem of turbocharging the 2-cycle engine in view of our experiences with the 4-cycle engine, which we have been turbocharging since 1934. That development, which later included the spark-ignited gas engine, is familiar to all. Typical of the latter type units are the 42 3700-hp supercharged gas engines at the Reynolds Metals plant that are attaining exceptionally low generating costs.

In all probability, the business of building heavy-duty gas and diesel engines is not too much different from that of any other similar enterprise where developments are frequent and highly competitive. The tendency is always to engage in a race so that one might attain credit for being first; consequently, new developments are often put into the field too soon. I believe all engine builders have been guilty of this, including Cooper-Bessemer.

Although the turbocharged 2-cycle has been a most interesting development and experience, we were satisfied to keep it under cover; meanwhile testing, improving, and continuing to watch carefully the European developments. (We have had the good fortune to be particularly close to one of the most prominent European attempts at 2-cycle turbocharging.) But good old American competition, for which we are devoutly thankful, frequently changes policies.

One engine builder announced last spring that he felt the stage had been reached where the engine could be offered for general use. There immediately arose considerable general interest in this method of scavenging the 2-cycle engine and we decided that it was time one of our engines should be put in the field where we could observe it under operating conditions. Therefore, one of our type GMV-10 turboflow engines, normally rated 1100 hp, was converted to turbocharging and has been operating on the line since early in December 1953. As far as we know, it was the first turbocharged 2-cycle gas engine to be put to work in the field. It is, as indicated above, a conversion which has a few slight handicaps over a new engine.

We should not be expected to report on all of the experimental work we have done, nor divulge any future plans. We regard the scope of this article as that of presenting a few interesting highlights of our experiences so far in attempting to make conservative comparisons between this method of scavenging and other methods which are already in current use.

As nearly as we can determine, everyone started with

the constant-pressure type of turbocharging. This type requires some additional means of starting the engine and of supplying its scavenging air up to a load which is higher than many of us were willing to rate engines until comparatively recently. Various engine builders approached this problem from different angles.

Our first approach was by means of a combustion chamber by which we ran the turbocharger as a gas turbine to facilitate starting and to provide scavenging air up to the load at which point the turbocharger could take over alone. We also experimented with various mechanical aids, providing mechanically-driven scavenging blowers to provide for starting and for the above load conditions. Following those experiences, we decided that if we had to have that type of equipment on an engine, it would be better if we left off the exhaust-driven turbochargers and used the mechanical means alone.

We therefore decided that we were going to concentrate all our efforts on a self-starting system and one which would be self-sustaining at all loads. Our experimental work for more than two years has been concentrated on that self-starting system. We solved the self-starting feature early in our experience; since then it has been no problem.

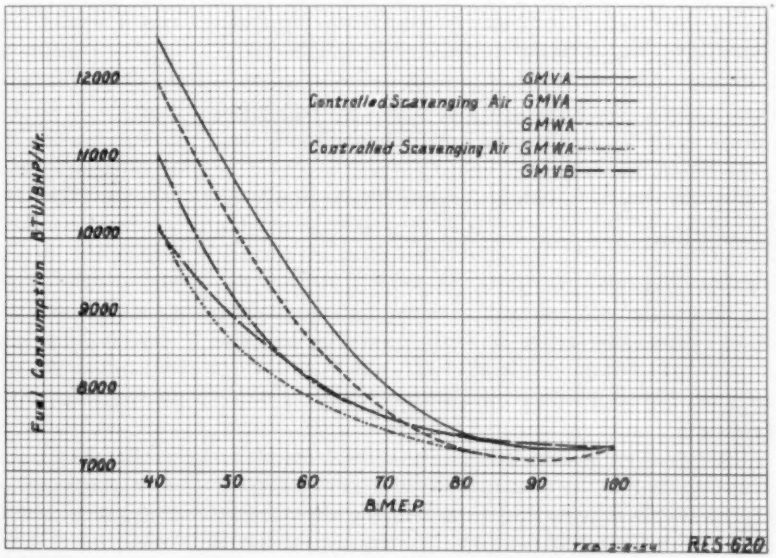
We have been rather surprised at the extreme interest that has been built up toward the turbocharger means of scavenging. While not wanting to jeopardize this enthusiasm, we do want all factors considered. Apparently the major item which has caused such intense interest is the general feeling that in turbocharging we get our scavenging air for no expenditure of energy. Unfortunately this is not true.

The turbocharged 2-cycle engine is relatively efficient. The percentage gain in efficiency over that of existing forms of engines depends on the starting point for the comparison. In the case of our highly-supercharged patented system used on the 4-cycle gas engines, there is no difficulty in showing a continuous performance of 6200 Btu/bhp/hr. Our form of 2-cycle turbocharging as applied to the field conversion has been showing about 7300 Btu/bhp/hr, or slightly less. A prediction is always dangerous for developments can take unforeseen trends; but it would appear that perhaps the ultimate on the turbocharged 2-cycle gas engine may be around 7000 Btu's, still maintaining self-starting. How favorable this figure is depends on the type of engine with which it is being compared.

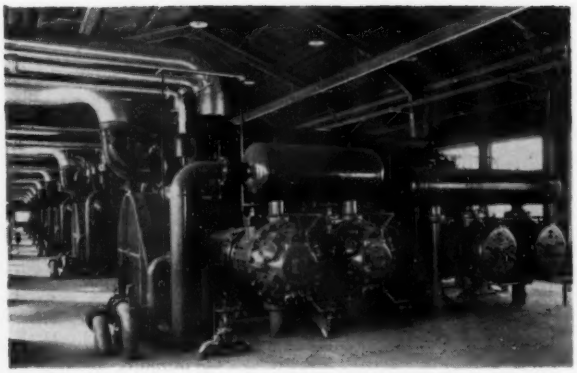
We have large numbers of 2-cycle gas engines in the field whose performance approximate 10,000 Btu/bhp/hr. With the current performance of the turbocharged engine, it therefore is possible to save 27 per cent on fuel. We also have large numbers of engines showing an average of approximately 8300 Btu's. Converting these engines to turbocharging might save approximately 12 per cent on fuel. Going still farther, we have a considerable number of engines in the field which are averaging 7500 Btu's. There it will be seen we have comparatively little to gain in fuel consumption.

Our latest 2-cycle compressor engines with gear-driven centrifugal blowers are showing from 7200 Btu's to 7400, depending on the size. Compared to those, we have little saving of fuel with which to sell turbocharging. Whether or not we feel we are getting something for nothing, we have merely to refer to the fuel consumption for the final answer.

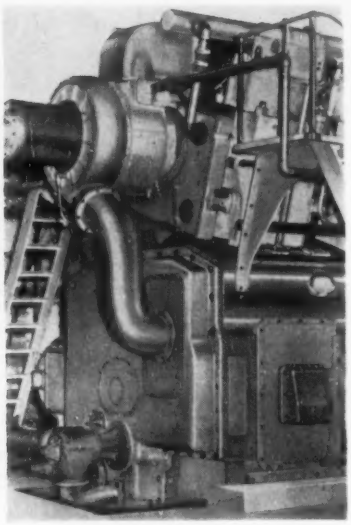
In the graph shown, we present these fuel consumptions in curve form at variable load. In explanation, our GMVA is a 14-in by 14-in engine with gear-driven centrifugal blower. The GMWA is an 18-in by 20-in engine with gear-driven centrifugal blower. The GMVB listed on the curve is the 14-in by 14-in turbocharged conversion. It will be noted that on new engines there is unfortunately very little to offer in the way of fuel consumption compared to our units with gear-driven centrifugal



Fuel consumption curves for different engines at various loads.



The nine Model GMVA's shown above are equipped with gear-driven centrifugal blowers.



This illustrates clearly how the turbocharger on one of the larger GMW engines has been worked into the exhaust and air systems so as to be readily adaptable to existing engines.

blowers. On conversions, it of course is another matter, for many of our customers do not have the more modern engines giving these higher efficiencies.

One very important point to consider is the ratings of different types of engines. If turbocharging will permit us to employ higher bmep, then it will have an advantage even though its efficiency may not be materially better. Unfortunately, we feel it is a little early to be certain of these ratings. We have operated with very high bmep ratings on the test floor and have been inclined to become quite enthusiastic on this score.

We have learned, painfully however, that a proper engine rating is not always a matter of percentage of overload ability, but is on the other hand more a matter of cylinder, ring, and piston life. We know that these cannot be determined with any accuracy without months of field time under actual operating conditions and that in order to be certain, this must include a hot summer. No one more fully appreciates this latter point than Cooper-Bessemer.

The engine we have in the field, as pointed out earlier in this article, has been running since early in December. That particular engine had been running several years at 1100 hp, the rating we gave it. Since conversion to turbocharging, it has been operating at from 1350-1500 hp, the latter figure being approximately 92 bmep. The same bore and stroke engine known as our GMVA, which has a gear-driven centrifugal blower, we very conservatively rate at 1350 hp having demonstrated that it will stand up reasonably well at 1500 hp. It is too early therefore to predict whether a final rating of the turbocharged engine gives it any particular advantage.

A very important item in any engine development is its cost. At this writing we do not have any exact figures, but the preliminary figures would indicate that there is no great difference in cost with the gear-driven centrifugal blower or with turbochargers.

One advantage of the turbocharged engine will probably be a lesser heat dissipation to the water, resulting in smaller and less costly heat dissipation equipment. This feature has been an important point in the development of the 4-cycle turbocharged engine. Our standard type GMVA with geared centrifugal scavenging has a maximum heat dissipation of 1700 Btu/bhp/hr. The turbocharged version has a considerably lower rate of heat dissipation but almost solely because the exhaust manifolds in the turbocharged version are not cooled.

We have been accustomed to cooling exhaust manifolds, mostly for station comfort, but that feature is responsible for about 40 per cent of the water heat dissipation and therefore that percentage of the cost of the cooling equipment. The turbocharged engine will dissipate some additional heat to the engineroom although the manifolds are protected by insulation.

The only reason we do not have water-jacketed manifolds on the turbocharged engine is that we want to conserve the heat energy for the turbine. To be fair to the mechanically-scavenged engine, it also may have dry insulated manifolds. By doing this, we find the heat dissipation rate of the mechanically scavenged engine to be under 1100 Btu/bhp/hr, and comparable to the turbocharged version.

We might conclude by a very brief summary. It would appear at this writing, and again we point out that this may be obsolete before it is printed, that fuel consumption while perhaps a little lower on the turbocharged-type engine will not be materially lower than with the gear-driven centrifugal. The fuel consumption gain can best be obtained by converting existing engines which do not have the higher efficiency of the later developments.

It still remains to be demonstrated whether the turbocharged engine can be rated at a higher bmep than the engine with the gear-driven centrifugal. Costs seem to be about the same either way.

We feel that it is too early to be certain of the future of the turbocharged engine and that even with our present field experience in addition to three years of experimental work, we must have more hours with part of them at summer temperatures before we would be willing to go into turbocharging on any broad scale. We believe turbocharging is one way of getting scavenging air in the future, but it has competition.

Improved D-8 Marks "Cat's" 50th Year

Caterpillar recently announced a 150-hp D-8 tractor designed for higher production.

TODAY, a real need has developed for higher capacity construction equipment. Miles of new turnpikes and throughways are either under construction or in the planning stages. Hundreds of miles of pipeline right-of-way will require clearing and mountains of earth will be moved this year. This however, is only a scratch on the surface. We could go on and on citing numerous construction projects, all of which require heavy construction machinery, but the capabilities of this equipment are the prime consideration to the operator. With operational and maintenance costs continually rising, economy of operation must go hand-in-hand with increased production.

To meet current demands of increased production, Caterpillar has introduced an improved D-8 tractor. Although similar in appearance to previous models, the new D-8 is powered by a 185-hp diesel turning at a governed speed of 1200 rpm. This provides 150 hp at the drawbar.

Inside the 185-hp engine, other changes are noticed. The cylinder head has been equipped with valve springs similar to those used on Cat's V-12 engines, and specially hardened valve seat inserts are also included.

In addition, valve rotators have been installed to extend valve life. Other changes include the camshaft; a stainless steel heat plug to protect the piston crater, an enlarged air inlet manifold; larger air cleaner; oil pressure throttle control system; and relocation of the lube oil pump to a point in the oil pan with pump drive taken from the front of the crankshaft.

Also featured in the new model is the oil-type clutch introduced into 1953 Cat production. The inclusion of this unit is said to contribute appreciably to the long life and low maintenance cost of the D-8.

As optional equipment, a heavy-duty transmission may be had in place of the standard unit. With the heavy-duty unit, the tractor is capable of developing a drawbar pull of 39,800 lb in first gear as opposed to that of the standard transmission which is 29,200 lb.

When engines are slowed down by overload, the calculated values in first gear for maximum drawbar pounds pull are 32,900 lb and 44,840 lb for the standard and heavy-duty transmissions respectively. As will be noted in the following table, speeds for the heavy-duty transmission are lower except for 1st and 2nd reverse, which are equal and higher respectively.

Standard Transmission					Heavy-Duty Transmission			
	Forward		Reverse		Forward		Reverse	
Gear	Mph	Fpm	Mph	Fpm	Mph	Fpm	Mph	Fpm
1st	1.9	167	1.9	167	1.4	123	1.9	167
2nd	2.7	238	2.7	238	2.2	194	3.0	264
3rd	3.5	308	5.8	510	3.1	273	5.2	458
4th	4.5	396			3.8	334		
5th	5.8	510			5.0	440		

Another optional transmission permitting a top speed of 7.2 mph is also available.

In addition to meeting the demand for heavy construction equipment with higher capacity, the introduction of the new Model D-8 appropriately marks Caterpillar's 50th anniversary in crawler tractor manufacturing.

OIL FILTRATION AND PURIFICATION

By J. S. McKeown

Technical & Research Division, The Texas Company, New York, N. Y.

An oil company looks at the oil conditioning problem. A review of the equipment available, practices, and various considerations.

OPERATING and maintenance conditions which prevail in a given system will dictate to a large extent the kind of performance that can be obtained with the oil, the equipment's life blood. Good lubricating oils resist unfavorable conditions longer than lower quality oils; no oil, however, can resist these conditions indefinitely and certainly, no oil can ever cure faulty operating conditions nor substitute completely for inadequate maintenance.

Experience has shown that a great majority of complaints originally assumed to be associated with malfunctioning of the lubricant can be traced to excessive contamination in service and inadequate maintenance practices.

Contamination from Extraneous Matter

Contaminants encountered with oils in service and the detrimental effects associated with them are discussed.

1. *Dirt and dust* can gain entrance through breather lines, leakage, or when carried by moisture. It is important to realize the effect of such contaminants on equipment wear; as catalysts in promoting oil oxidation; and as emulsion stabilizers with water, promoting sludging conditions. Plugging of oil lines may result and contaminant effect on water-separating characteristics and foaming must also be considered.

2. *Water* from condensation, gland or seal leakage, cooling coil leakage, etc., can cause rusting of parts. This contaminant promotes oil oxidation and sludging and plays a part with dirt in forming emulsions with oil. Metals and metal compounds that act as catalysts in promoting oil oxidation (*i.e.*, zinc, copper, iron, lead, etc.) are considerably more active in the presence of moisture.

3. *Core sand* that has remained in metal castings or *metal particles* left from the machine or repair shop can cause results similar to those described in Item 1.

4. *Metal particles* due to disintegration or wearing of parts such as bearings, piston rings, gears, etc., lead to similar results.

5. *Carbon* and other products of partial decomposition or oxidation resulting from destruction of oil or incomplete combustion of fuel lead to further oil oxidation and sludge deposition within the system. Hard varnish-like deposits and coking may result at some points.

6. *Fuel dilution* through faulty fuel systems or cold operation has an adverse effect on oil stability and can cause dangerous reduction in oil viscosity.

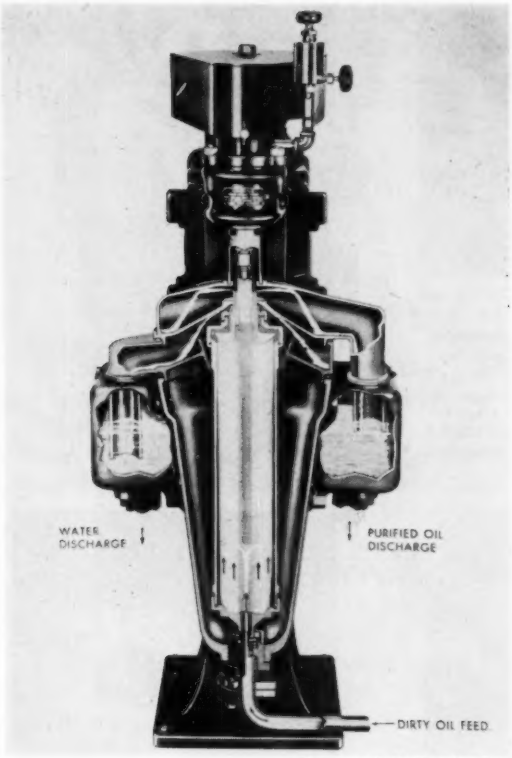
7. *Anti-freeze* and cooling system chemicals from water leakage from cooling systems can cause almost immediate oil sludging and some chemical changes may lead to engine seizure.

8. *Miscellaneous contaminants* such as paint from inside surface coatings, asbestos, and packing material, etc., can plug oil lines and cause oil sludging.

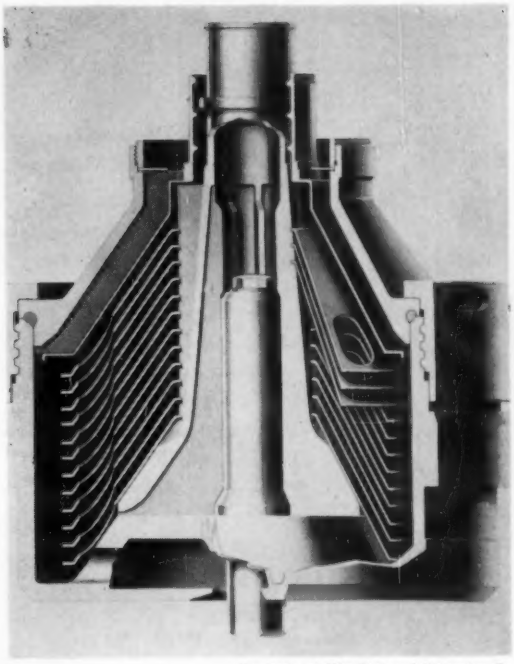
Contaminants from Oil Oxidation

1. Oil will deteriorate due to oxidation in the presence of air or other oxygen-containing media, accompanied by high-temperature service. This process is catalyzed by metals and associated compounds especially in fine particle form. Some of the most usual active catalysts are zinc, lead, iron, and copper. Products of oxidation in the initial stages may be oil soluble but will become oil insoluble as deterioration continues.

2. Some oils deteriorate due to polymerization (linkage of unsaturated oil molecules to form progressively heavier molecules causing oil thickening), as a result of high- as well as normal-temperature service. Products of



Courtesy of the Sharples Corp.



Courtesy of The DeLaval Separator Co.

Centrifuges are used in many installations to remove water and dirt from fuel and lube. Shown are a cut-away of the tubular-bowl type (left) and conical-disc type (right).

polymerization will be oil soluble at the start but they become oil insoluble as the process continues.

3. Some oils develop sludge under sub-normal temperatures of operation where products of contamination combine with the oil to form a mayonnaise-like sludge emulsion.

Once the process of oil oxidation starts, the situation becomes progressively worse since it is self-accelerating. Proper selection of oil and proper selection of auxiliary equipment to keep it clean is necessary to obtain long equipment life with minimum downtime, low repair costs, and to reduce the frequency of oil changes and general overhauling.

Keeping lubricating oil clean was a logical development along with flood lubrication and both accompanied the development of the internal combustion engine. Close cooperation between the oil supplier, equipment manufacturer, and the suppliers of oil filters and purifiers assures the consumer the most trouble-free operation and lowest overall operation costs.

Selecting Cleaning Equipment

The ultimate in oil conditioning equipment would be the incorporation of a design to permit most efficient purification at the fastest rate involving the least cost and space. Many factors must be considered in the selection of such auxiliary equipment for a given unit.

a. Type and size of unit involved.

b. Type of oil in use, viscosity, etc.

c. Economics. (Capital investment, installation and maintenance costs as compared to extended oil and equipment life.)

d. Service involved and conditions of operation.

e. Volume of oil involved.

f. Available space.

g. Type and amount of contamination and combinations of contaminants normally encountered.

h. Adapatability of unit to auxiliary equipment.

i. Type and quality of fuel used.

Oil purifying methods involve either batch operation, continuous in-service operation, or a combination of these two. Batch operation may require equipment shutdown while changeover is accomplished unless two batches of oil are used.

In addition, it does not permit contaminant removal as it occurs, so during the period of build-up serious changes can result.

Oil conditioning is contingent upon two basic types of equipment.

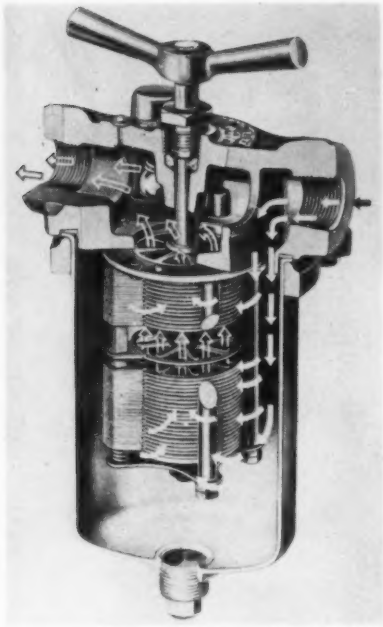
1. A system which can only remove insoluble materials.

a. Settlers.

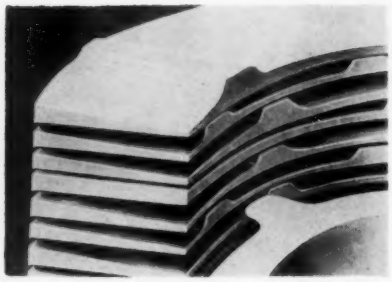
b. Centrifuges.

c. Filters of the inactive type using either gravity or pressure arrangement.

d. Metal strainers.

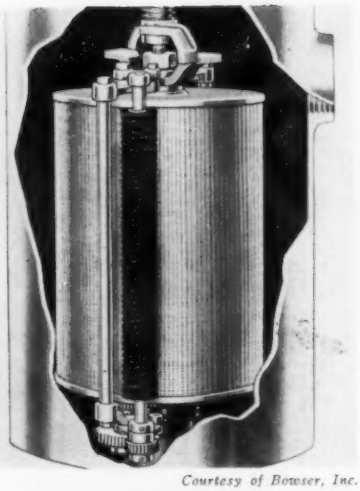


Courtesy of The Cuno Engineering Corp.

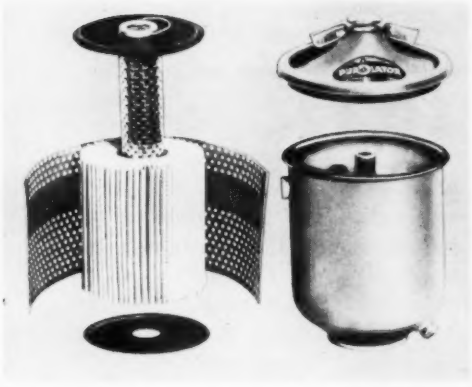


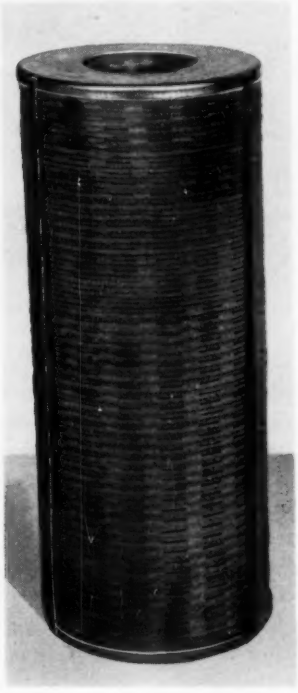
Courtesy of Purolator Products, Inc.

At left, edge-type filter with stationary cleaner blades. Cutaway of another edge-type filter design is shown above. Here, a continuous metal ribbon is wound edgewise to form a complete cleanable element. Automatic, self-cleaning filter (right) works on mechanical cylinder pressure.

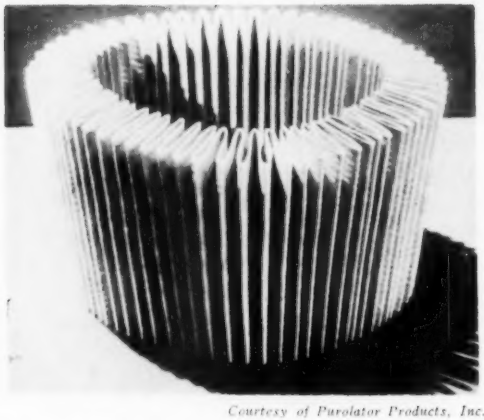


Courtesy of Bowser, Inc.



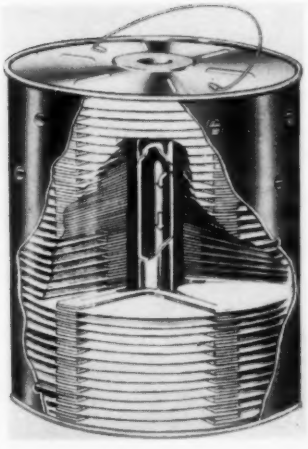


Courtesy of The Briggs Filtration Co.



Courtesy of Purolator Products, Inc.

Extended area, surface-type filters. Above, components of resin-impregnated, pleated paper-type filter. Cellulose disc-packed filter (upper right). Filter discs separate oil inlet and outlet discs in the order shown. Another extended area design is the cellulose disc cartridge at right.



Courtesy of the Fram Corp.

2. A system which removes insoluble materials and also the oil soluble oxidation products.

a. Filters of the active type containing Fuller's earth, charcoal, bone black or some type of activated alumina or clay.

b. Water-washing to precipitate oil soluble oxidation products followed by use of filter, settler, or centrifuge.

Gravity Settling

1. *Settling Tanks*—The simplest means of effecting at least partial clarification of a used oil is to allow it to stand quietly for a time in some form of settling tank. It is generally possible to remove suspended insoluble oxidized material, foreign particles, dirt and water. Gravity separation is commonly used in systems with large volumes of oil and systems where water contamination is extensive.

The equipment available for settling will control the effectiveness of the procedure. By means of bottom draw-offs, adjustable pump-out lines or manual decanting of the clear oil (in smaller units), the clarified oil is separated from the settled materials. Settling is most effective in flat or horizontal tanks of minimum depth with sloping or trough bottoms. It is generally accepted that the best results are obtained at settling temperatures of 120°F to 140°F.

2. *Baffle Gravity Settlers (For continuous, intermittent or batch purification)*—A faster but generally less effective arrangement makes use of a baffle or tray arrangement to direct flow of oil in shallow layers. It is generally used where contamination is heavy and where supplementary filtering equipment can be used. Often this baffle-type gravity settler is used in a compact unit as the initial purification stage to remove the bulk of insoluble contaminants. Oil entering at the bottom passes over a number of staggered trays at various levels as it works to the top of the unit where it overflows to a polishing unit of filters or an arrangement of plate and frame presses. An automatic water ejector is common to this type of unit.

Centrifugal Treatment

The centrifuge effectually frees an oil of suspended insoluble oxidized material, foreign mineral matter, dirt, and water. It will not separate liquids which have the same specific gravities. As with settling and decantation, separation of oil contaminants is made according to gravity, accelerated by centrifugal force and is effective with any oil containing impurities heavier than the oil.

The term "capacity" as applied to a centrifuge often is used loosely. A centrifuge may be said to have two capacities:

1. *Through-put capacity* is the total quantity of oil that can be put through the machine regardless of the degree of purification effected and without overflowing.

2. *Effective capacity* is the quantity of oil that can be put through the machine with the desired degree of purification.

Effective capacity depends upon used-oil viscosity, temperature, degree of purification desired, and persistency of emulsion if water is present.

An oil purification centrifuge should always be set to operate by the two-liquid discharge method. This does not necessarily mean that water should be added at the centrifuge, but the discharge opening should be provided to emit any water which may be in the oil.

Centrifuging is often referred to as "wet" or "dry", according to whether or not water is intentionally added to the oil at the centrifuge. Sometimes wet centrifuging is not advisable, but when it will work, cleaner oil will result from the controlled addition of water. Centrifuging "wet" has the following advantages:

1. The washing effect of water aids in the removal of oil-insoluble impurities.

2. The water carries away lighter weight impurities with a gravity approximately that of water, permitting longer runs between cleanings.

3. Some organic acids formed by oxidation are more soluble in water than in petroleum oil and are thus removed, reducing rate of oxidation.

The objections to "wet" centrifuging include:

1. Water-washing may remove inhibitors from some inhibited oils; it is not normally recommended for additive oils.

2. If periodic centrifuge cleaning is neglected, the water discharge outlet may plug, causing the centrifuge to fill with water which will pass to the system through the clean-oil discharge.

3. If the oil becomes dirty, emulsions may occur, aggravated by addition of water in such cases, and resulting in less purification.

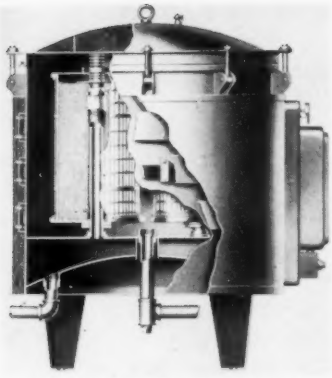
In centrifuging, best results will be obtained by preheating the oil to around 160°F or slightly higher, depending on the viscosity. Heaters must always be handled very carefully to prevent local overheating of the oil.

Filters

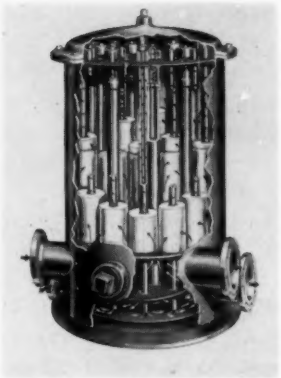
A filter is a mechanical device which acts as a barrier in the path of the oil and serves to remove the non-oil components. Filter media may be solids such as porous metal, metal screens, or composition materials; semi-solids such as paper or cloth; or loose materials in powder form such as Fuller's earth, bone-black, etc.

The question of compatibility of the oil with the filter media should be considered. Some chemical additives used in present-day oils may not be compatible with a particular filter media under the conditions of use and may lead to unsatisfactory filter performance and/or short filter life.

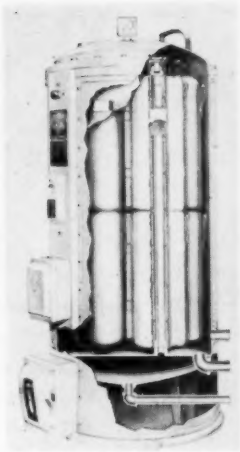
A wide variety of filters are available today and the proper selection depends upon full knowledge of the operational conditions and the types of contaminants to be encountered. For example, the most efficient filter



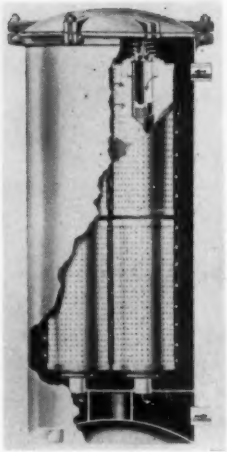
Courtesy of U.S. Hoffman Machinery Corp.



Courtesy of Winslow Engineering Co.

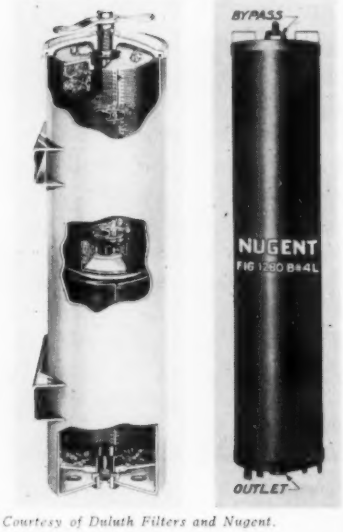


Courtesy of Honan Crane Corp.



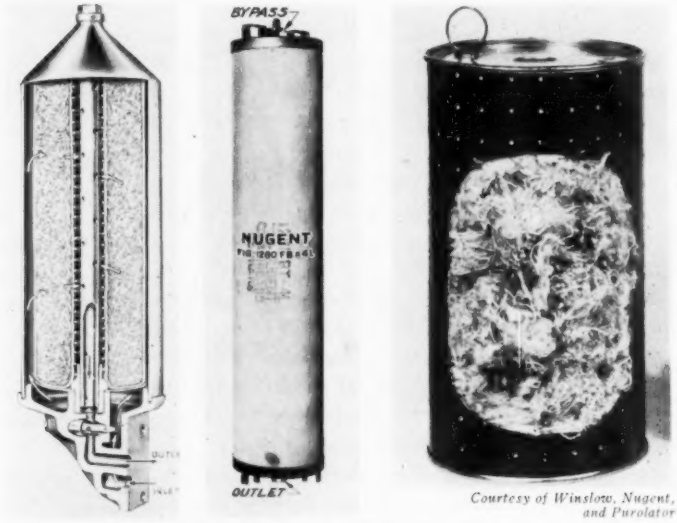
Courtesy of the Hilliard Corp.

Examples of multiple-cartridge, replaceable element filters.



Courtesy of Duluth Filters and Nugent.

Examples of the refillable or repack-type cartridge.



Courtesy of Winslow, Nugent, and Purolator

Illustrating throwaway cartridge types.

for a given job may have an excessively high plugging rate and would not be practical.

The various types can be divided into three main categories:

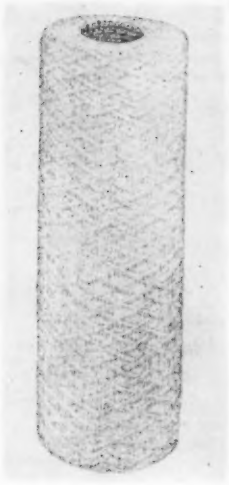
1. *Mechanical Filters*
   a. Metal screens.
   b. Edge-type filters.
   c. Extended-area surface-type filters.
   d. Bag-type filters.

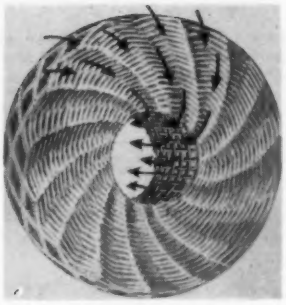
Filters in groups (a) and (b) are designed for use in pressure circulating systems and will remove coarse contaminants such as metal chips, grit, scale, etc. Insoluble oxidized material is generally not removed unless the size of the particles is sufficiently large to be caught by the filter element openings. Nor can soluble oxidized material, finely divided carbon particles, water, dust, and the finer oxidized materials can be removed by such filters.

Some edge-type filters are made by packing cartridges with layers of impregnated cellulose discs with alternate layers of cellulose spacers or layers of metal discs with suitable spacers, the openings between the discs determining the flow rate, contaminant capacity, and efficiency. Others are made by packing cartridges with metal wool or by helically winding impregnated cellulose or metal ribbon to form self-contained cylinders. Here again, the space between the metal-wool strands or ribbon determines the flow rate, contaminant capacity, and filter efficiency.

The extended-area filter (c) is commonly used with internal combustion engines. This type makes use of pleat-folded impregnated paper, or some equivalent configuration, in replaceable cartridges to give the largest possible filter surface area per unit volume. These filters do not channel. In automotive truck and tractor systems where used extensively, they are either by-pass, full-flow, or shunt-connected, and serve this type of system very efficiently.

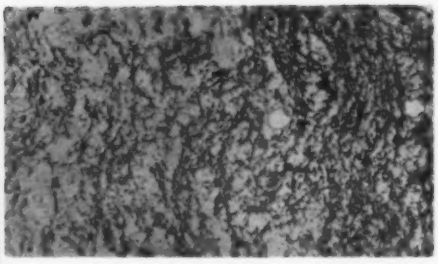
The trend is toward the use of full-flow connection with suitable safety valve to guarantee oil feed to criti-





Courtesy of Commercial Filters Corp.

Cellulose fibers wound in a honeycomb pattern to give depth filtration with controlled graduated density. Fibers are combed across openings at each successive layer.



Courtesy of The Cuno Engineering Corp.

Another filter of graduated density. Successively smaller particles are trapped as oil moves toward the center. Less dense side is pressure surface.

cal parts. Usually such filters are equipped with inserts that can be replaced at intervals as they become "loaded".

Bag filters (d) of reinforced cloth construction are used to some extent and may be employed alone or in conjunction with other systems. Some systems employ a compact unit combining gravity settlers in conjunction with a series of replaceable bags. The gravity dry process permits removal of water in the precipitation chamber and sludge and solids removal in the filter bag compartment. Most systems of this type are designed to permit removal of individual bags for cleaning while the system is in operation. Bag filters can be used efficiently for either continuous, by-pass, or batch operation.

For systems where relatively higher oil viscosities prevail, pressures of 20 to 40 psi are used instead of gravity. When the pressure drop across the filter exceeds a prescribed value, bags are to be cleaned.

2. *Absorbent Filters* may be of bulk or cartridge-type, and employ such materials as cotton waste, wood pulp or bark, wound yarn, nylon, felt, flannel, wool, hair, paper, mineral wool, quartz, diatomaceous earth, asbestos, etc. Absorbent filters not only remove coarse contaminants, but go a step further by removing more of the finely-divided insoluble oxidized materials, some moisture and some acids formed through oil oxidation. Filtration is accomplished by adhesion of contaminants to the surfaces of the filtering material and absorption by the components of the filter due to porosity.

Efficiency will normally improve with use as a filter bed builds up. Excessive water contamination may materially reduce the efficiency of such units however, and preliminary heating, separation processes, or gravity settling methods are often employed when excessive water contamination is encountered.

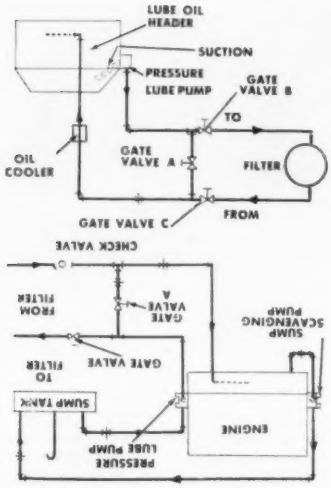
Depth-type filters require the oil to flow through a depth of filter medium and may be either of the replaceable cartridge or bulk type. Oil will flow from the outside through the full depth of the filtering-media to the outlet tube on the inside. Changes normally are controlled by noting pressure drop, excessive pressure drop indicating need for change.

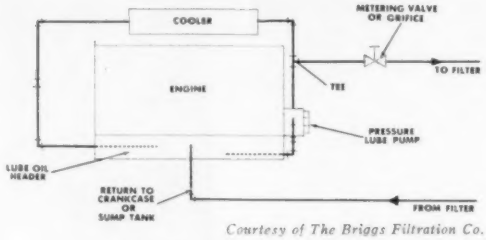
Such filters can be of constant or graded density. With the latter, the density can be controlled radially and concentrically. Smaller particles therefore can penetrate to greater depths in the filter and prevent early sealing of the surface with resulting decreases in oil through-put.

On by-pass or shunt-connected systems, oil appearance can be noted or oil analysis may be required to indicate when filters have become plugged. With detergent oils, an examination of the filter itself is required to determine whether it has reached its useful life. Channelling is sometimes encountered with some bulk-type media and when such occurs, filtering efficiency is greatly diminished.

3. *Adsorbent Filters* contain Fuller's earth, bone-black, charcoal, or some active type of alumina or clay. In addition to removing coarse and fine contaminants, these filters also remove soluble oxidized material. Since water tends to make this medium ineffective, many adsorbent filters also contain absorbent media or other means for removing the water. With some clay-type filters, the clay may mud, pack, or channel and prevent further action on the oil.

In filters of this type, oil contaminants not only adhere to the surfaces of the filtering material, but also actually penetrate. This may be a disadvantage when dealing with an oil containing a chemical additive. The filtering material may remove the polar chemical detergent, corrosive or oxidation-inhibiting components. Obviously, extreme care should be observed in applying adsorbent-type filters to a lubricating system. With





Courtesy of The Briggs Filtration Co.

Typical full-flow installation on wet-sump engine (top left) and dry sump engine (bottom left) Modification to shunt system requires only provision of lower pressure relief valve and suitable piping to handle divided flow as pressure drop of element increases.

Typical by-pass installation (above). Note location of metering valve or orifice to maintain pressure on the line to cooler.

straight mineral oils however, they have proven very effective in increasing useful oil life.

These filters are available alone or in combination with absorbent and mechanical filters in a single compact unit. The units may be replaceable cartridge or bulk type. Filtering material can be procured for the bulk type so that the user can fabricate his own refills. Knowledge of how to pack these filters however, is of utmost importance to insure against channelling in use. For high-flow rates, multiple cartridge units are advisable.

System Arrangements

There are four commonly-used methods of installation.

The By-Pass method, perhaps the most common, operates on only a portion of the oil in the system and takes its supply off the main lubricant line, usually between the discharge pump and the lubricant cooler. The amount by-passed is generally only about 10 per cent of the quantity of oil circulated by the oil pump, and this is returned generally to the sump. By this arrangement, the lubricated area is never supplied with 100 per cent purified oil.

The Independent System makes use of an auxiliary pump completely separate from the lubricating system. A portion of the system oil is pumped through the filter or purifier and then returned directly to the sump or crankcase.

The Shunt connection as used with cartridge filters, allows the flow of oil from the lubricating oil pump to pass through the oil filter. These shunt-type filters are equipped with relief valves. The entire flow of oil at first goes through the cartridges. As the cartridges load up with contaminants, the flow of oil is divided. Part of the oil then goes through the cartridge and the balance through the relief valve. After the filter, both flows unite.

The Full-flow connection as used with filters, is identical with the shunt hook-up. Basically the difference in the two methods is that the 100 per cent-flow filter must contain sufficient cartridges for a given unit to permit all of the oil entering the filter to pass through the cartridges without by-passing through the relief valves under normal operating conditions.

Results

Oil cleanliness has a directly measurable correlation with engine wear, operating and maintenance costs, out-of-operation time, length of time between overhauls, etc. It has been shown that efficient oil conditioning equipment, especially with full-flow continuous operation, can result in at least 50 per cent reduction in wear and 50-60 per cent reduction in overall costs.

This is understandable when it is considered that practically all of the contaminants described previously can be found in used engine oils at one time or another. Aside from engine wear, such contaminants contribute in no small way to bearing corrosion problems, oil line plugging with subsequent oil starvation, stuck valves and hydraulic valve lifters, ring sticking, oil ring plugging, etc.

The seriousness of contaminated oil in modern high-speed, high-compression engines, and the necessity of preventing contaminant build-up in critical areas, has brought about the widespread use of heavy-duty high detergent motor oils. These oils are essential to preserve the high-power, high-fuel economy, trouble-free operation available. They do not however eliminate the need for filters.

Although a wide variety of filters and oil purifiers are used in stationary service, the space limitations of on-the-road units generally necessitate the use of relatively small filter cartridges. This explains the wide acceptability of the extended area type.

There is a rapid trend towards the use of the full-flow design. Special design units are available to provide full-flow filtered oils to critical areas with shunt or by-pass filtered oils to less critical areas. The ultimate is a unit designed to give high-flow rates at very low pressure drops, to have unlimited contaminant capacity and give efficient purification.

More Power for P&H Engines

Engine improvements permitting substantial uprating result in weight/power ratios as low as 7.06 lb/hp.

Ranging in horsepower from 35 to 255, the series C-18 engines are adaptable for either industrial, marine or automotive service. Shown, is the Model 687C-18 fan to flywheel engine.

HARNISCHFEGER has put into production a line of improved engines incorporating 52 major advancements and refinements. An accelerated research and development program was initiated with the objective of seeing what could be done with then current models to obtain greater dependability, more power, higher useable speeds, better efficiency, more horsepower per pound, and lower cost per horsepower. Basic design of the existing 2-cycle engine was to be retained and emphasis placed on achieving greater simplicity of design and construction.

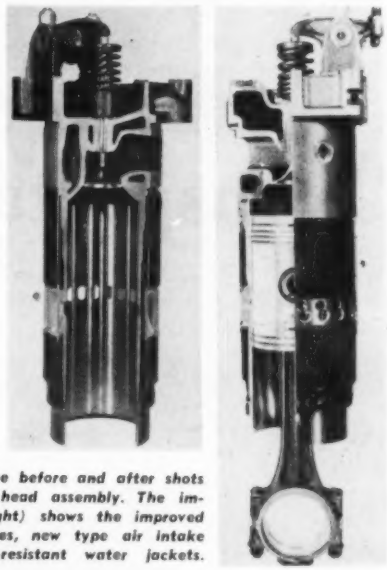
The result was the Series C-18 engines. Like their forerunners, the engines are built in 2-, 3-, 4-, and 6-cyl models. Bore and stroke are still 4½-in by 5½-in to give a displacement of 87 cu in per cyl. Compression ratio on all models is 16 to 1. Horsepower increases amount to 36 per cent, giving a range from 58 to 255 hp.

P&H engines have always been notable for the unique and practical design of their cylinder assembly. It is here that some of the most important changes were made although the original concept was fully retained. Porting was redesigned to impart greater air turbulence and the valving arrangement was also changed. This produced more effective scavenging and greater combustion efficiency. More air is supplied by new blower construction.

Cooling capacity was increased to accommodate the higher ratings by enlarging water passages and adding new channels in vital areas. Cooling is now uniform over the full length of the liner. The steel jackets, also new, have been Parkerized for maximum corrosion resistance. This is possible because of the "built-up" construction of the cylinder assembly. The liner is now a special alloy cast iron selected for its propensity to keep surfaces "oil-wet" at all times.

All of the components of the assembly can be replaced separately in the field. However, the ability to change the whole cylinder head and liner assembly in a matter of 30 minutes, without dropping the oil pan or dismounting the engine, has not been changed. As in the earlier models, a complete change of the power assemblies can be made overnight on even the largest engine, thus reducing downtime to a minimum.

In the redesign of the cylinder assembly, the combustion chamber was reshaped for greater efficiency. By shouldering the cylinder head to cover a portion of the bore, the combustion chamber is concentrated in the center of the head and a "squish" area, promoting greater turbulence, is formed at the sides. The pistons are now flat on top, placing the combustion chamber almost completely in the cylinder head.

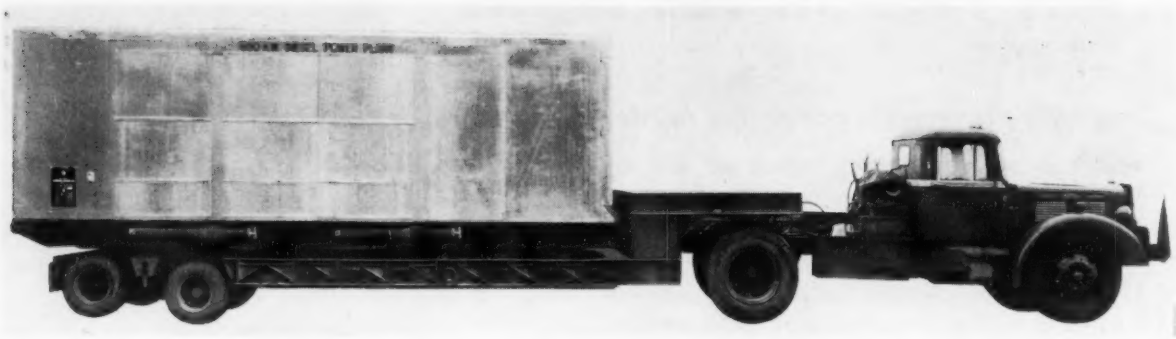


From left to right are before and after shots of the cylinder and head assembly. The improved model (at right) shows the improved cooling water passages, new type air intake ports and corrosion-resistant water jackets.

Other refinements include a camshaft redesign to improve timing, promote easier starting, and permit higher rpm. Injectors were changed to include special tips developed by P&H. They produce a soft spray pattern through the use of a single orifice. The exhaust manifold was redesigned for better gas flow and hence, less possibility of back-pressure. Both the lubrication system and oil control were improved.

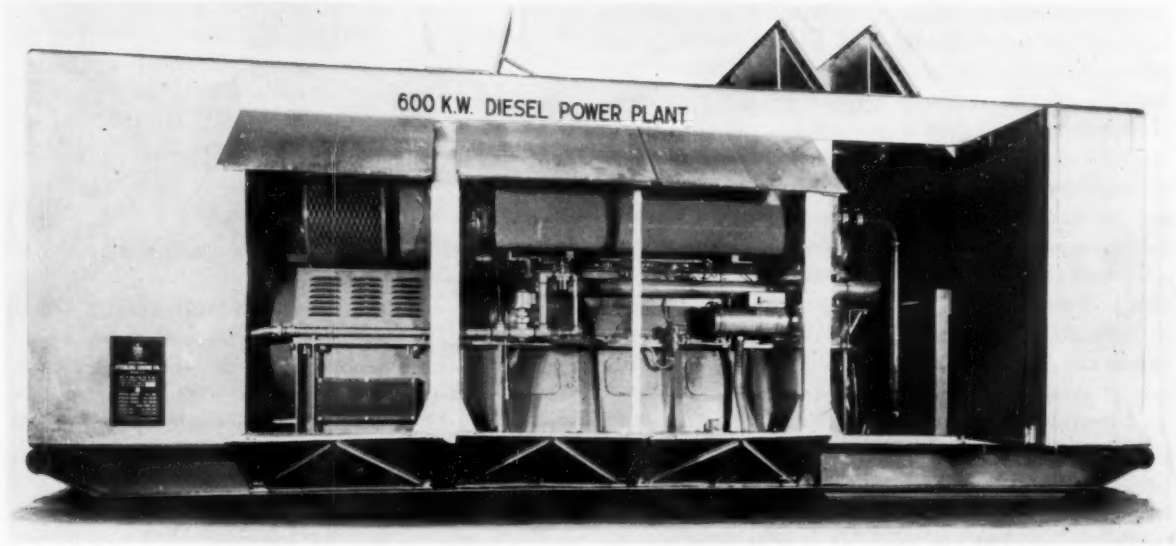
The aluminum alloy crankcase and block construction of the former models was retained. Coupled with the increased horsepower ratings, this is believed to give the new engines more power per pound than any American built diesel that is commercially available. The 6-cyl engine weighs 1800 lb for 7.06 lb/hp; the 4-cyl model, 1500 lb for 8.33 lb/hp; the 3-cyl engine, 1190 lb for 9.30 lb/hp; and the 2-cyl unit with a weight of 975 lb has a ratio of 12.50 lb/hp.

Through this comprehensive redesign, the objectives of the development program were substantially achieved. The low weight to horsepower ratios should solve problems in a lot of applications where this has been a critical factor. The new high ratings, possible without sacrifice of dependability or service life thanks to the new design features, will result in lower cost per horsepower.



Transportable Power

Open side panels afford complete access while also forming handy servicing platform and overhead shelter.



Highlighting a late development in the concept of "power-where-you-want-it". A turn-key installation — prime-mover, generation equipment, all accessories, and protective structure — is readily transportable to the point of need.

A NEW mobile generating unit currently being produced by Sterling Engine Company is a complete power plant. Securely enclosed in a lightweight, weather-resistant housing and skid-mounted, this power plant that moves on wheels, by rail, or by water, was developed in cooperation with and to meet the requirements of the Bureau of Yards and Docks, Department of the Navy. It is, however, being manufactured as a Sterling commercial unit available to industry.

Dry weight of this power plant is 45,000 lb . . . 22½ ton. It delivers a full 600 kw of usable energy to the bus or supply line it is feeding. And this is its continuous duty rating. Also, it is capable of operating for at least two hours at 10 per cent overload.

This power plant, one of several available sizes developed by Sterling, is complete in every detail. It is designed to permit transportation at 35 mph over rough terrain and to operate in a range of temperatures from 0°F to 125°F when it gets to its destination. It is seen as a unit well suited for a wide range of applications including:

1. A ready power source for out-of-the-way locations —a new mine, construction project, oil field, etc.
2. To help handle seasonal or temporary peak loads at outlying points in a transmission system.
3. To introduce power in an area pending design and construction of permanent power facilities or transmission line.
4. For emergency standby service anywhere.
5. For rapid movement to any locality hit by hurricane, tornado, flood, explosion, or other disaster.

The prime mover is a Sterling diesel embodying all of the latest improvements in this line of engines. It is a 4-cycle, 8-cyl engine, 8-in bore by 9-in stroke, having a supercharged rating of 1000 hp at 1200 rpm. An exhaust-driven turbocharger is used.

Several features of this engine make it well adapted for the type of service envisioned for the unit. For example, parts requiring removal or replacement are of such size and weight as to permit handling without the aid of hoists or other lifting gear. In line with this, each cylinder is fitted with an individual head of high-nickel cast iron. Pistons are of lightweight aluminum alloy, oil-cooled and fitted with four compression, and one oil control, rings.

Illustrating accessibility, the nine main bearings of the "tri-metal" precision-type are removable through handholes in the crankcase without disturbing or removing the crankshaft. Other engine details are in keeping with the latest thinking along these lines. That comfort and safety in the necessarily restricted space were considered along with functionalism is shown by such items as the water-cooling of the exhaust manifold.

All of the engine systems are complete. A large radiator is mounted in one end of the housing and is arranged to cool both engine jacket water and lubricating oil. It is fitted with metal shutters on the front side that are operated by modulating motors. They are controlled automatically to provide the proper amount of cooling by adjusting the shutters to conform with fluctuations in jacket water temperature.

An air motor is used for starting the main engine. Under extreme cold weather conditions, it is necessary to supply heat to the engine before starting or during extended non-operating periods. For this purpose, a compact oil-burning heater of 60,000 Btu/hr output is mounted on the engine. It is provided with its own fuel oil and water circulating pumps and automatic controls.

Automatic devices protect the engine against abnormal jacket water temperature, lube oil pressure, and overspeeding by actuating signals and shutting down the engine. Instrumentation is very complete. The operating panel carries a multi-point pyrometer, tachometer, hour meter, oil and water temperature indicators, air and oil pressure gauges, starting controls—including those for the engine heater, and various signals and safety devices.

The main generator is rated 600 kw, 2400/4160-v, 3-phase, 60-cycle at 0.8 power factor, delivered to the bus, exclusive of accessory loads. It is of single-bearing construction with exciter direct-connected to the free end of the generator rotor. Generator control switchgear is fully metal-enclosed and has two compartments, one for low-voltage and one for high-voltage equipment. Through a change-over panel, the plant can be connected for 2400 volts "delta" or 4160 volts "star".

Frequency control is assured by the engine's hydraulic isochronous governor. Full equipment is provided for parallel operation of the plant with others of similar design. All of the electrical equipment is fungus-proofed.

A 6-kw, 120/208-v auxiliary diesel generator set is also included to supply power for lighting, heating, and auxiliaries. In addition, current for emergency lighting and

List of Principal Equipment

Engine	Sterling Engine Co.
Injection Equipment	American Bosch Corp.
Governor	Woodward Governor Co.
Turbocharger	Elliott Co.
Electrical Equipment	
Generator and Exciter	Electric Machinery Mfg. Co.
Switchgear	Electric Machinery Mfg. Co.
Voltage Regulator	Allis-Chalmers Mfg. Co.
Fuel System	
Supply Pumps	J. S. Barnes Corp.
Priming Pump (hand)	The Deming Co.
Filters	Cuno Engineering Corp.
Lube Oil System	
Purifier	Hilliard Corp.
Strainers	Cuno Engineering Corp.
Air Filter	Air-Maze Corp.
Cooling System	
Radiator for Water and Lube	Young Radiator Co.
Radiator Fan	Koppers Co., Inc.
Shutters and Controls	Minneapolis-Honeywell Reg. Co.
Starting System	
Air Cranking Motor	Ingersoll-Rand Co.
Air Compressor	Worthington Corp.
Solenoid Air Valve	Automatic Switch Co.
Engine Coolant Heater	Perfection Stove Co.
Instrumentation, Alarms, Etc.	
Water Temperature, Lube Oil Pressure and Overspeed Switches	Synchro-Start Products
Pyrometer	Illinois Testing Laboratories, Inc.
Tachometer	Weston Electric Instrument Corp.
Thermometers	Weksler Thermometer Corp.
Auxiliary Equipment	
Auxiliary Diesel	Nordberg Mfg. Co.
Generator	Winpower Mfg. Co.
Batteries	Electric Storage Battery Co.

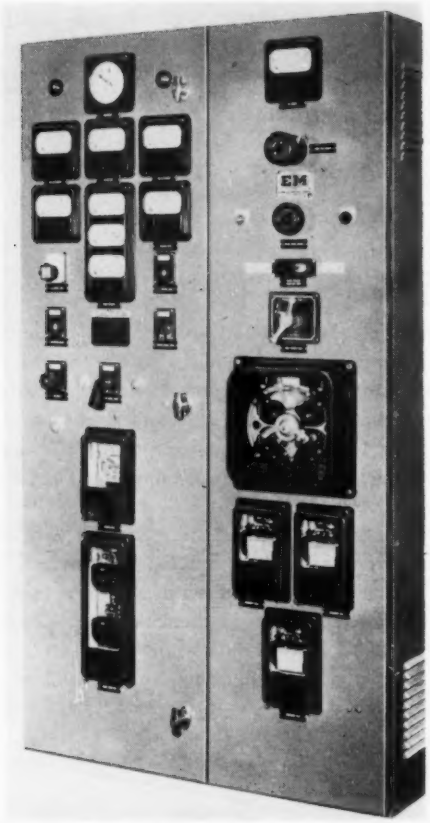
for starting the auxiliary generating unit is provided by a 12-v storage battery.

All of this equipment is mounted on a unit skid foundation of welded steel construction, amply braced for rigidity and arranged for 3-point suspension. Within the base are storage tanks providing capacity for 1100 gal of fuel oil and 60 gal of lube oil. It can be seen that this is a completely self-contained power plant, capable of many hours of operation in isolated places with its self-carried supplies. When replenished at regular intervals, it can operate indefinitely.

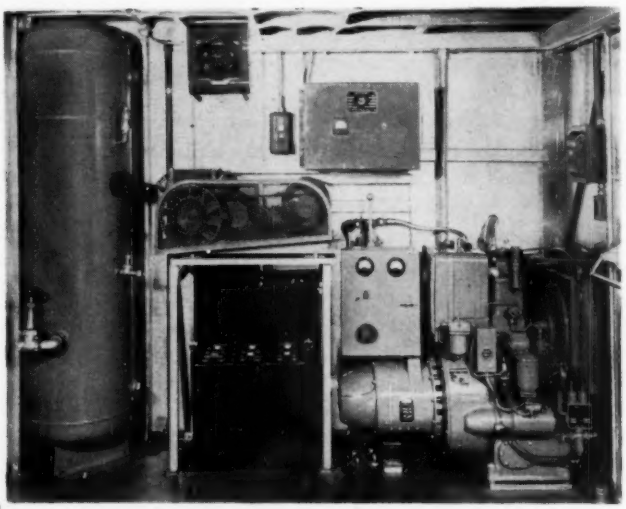
There is a good deal to be said in favor of generating plants of this type. Fast delivery is possible from the viewpoints of manufacture, transportation and installation. Units are standardized and completely engineered. This is reflected in costs of purchase, installation, and operation. Standardized items are selected to work together, assuring good operation with maximum facility for repair and replacement to minimize downtime. Special foundations and buildings are not required. The rigidity of the engine sub-bases insures continuity of engine-generator alignment.

Flexibility of application is a major asset. You can get power where you want it and when you want it with minimum delay. Also, the plant can be used as long as necessary in one spot and then, should the need no longer exist, it can be moved to another site.

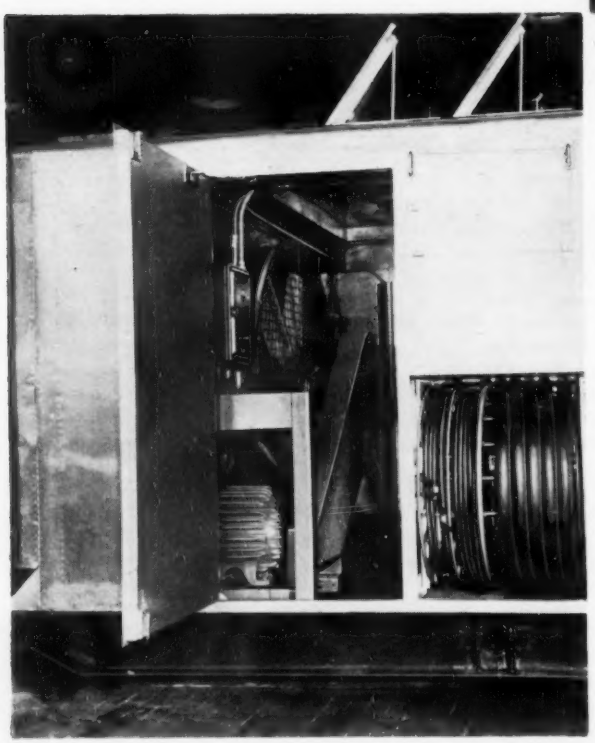
All of these advantages and considerations were given attention in the design of these particular units. Still wider application is achieved by the production of a range of sizes, either mobile or for fixed installation, in capacities from 250 to 1000 kw.



Completeness of switchboard is seen above. It supplies power to the cable reel seen below that provides easy connection to loads. Also seen is the motor and fan assembly to provide air flow through the cooling radiator.



Auxiliary diesel generator set is at right. Its starting and emergency lighting is provided by the battery. Starting air tank for main engine is at left with compressor above battery.



ENGINE SPECIFICATIONS 1954

Diesel Dual-Fuel Natural Gas

Data on Engines Manufactured by American Diesel Engine Builders

American Locomotive Co. 87
Baldwin-Lima-Hamilton Corp. 87
Buda Co. 87
Caterpillar Tractor Co. 87
Chicago Pneumatic Tool Co. 88
Clark Brothers Co. 88
Climax Engine & Pump Mfg. Co. 88
Continental Motors Corp. 89
Cooper-Bessemer Corp. 89
Cummins Engine Co., Inc. 89
Enterprise Engine & Foundry Co. 90
Fairbanks, Morse & Co. 90
GM-Cleveland Diesel Div. 90
GM-Detroit Diesel Engine Div. 91
GM-Electro-Motive Div. 91
Gray Marine Motor Co. 91
Hallett Mfg. Co. 91
Harnischefeger Corp., P&H Diesel Div. 91
Hercules Motors Corp. 92
Hill Diesel Engine Corp. 92
Ingersoll-Rand Co. 92
International Harvester Co. 93
Kahlenberg Brothers Co. 93
Lathrop Engine Co. 93
Le Roi Co. 93
Lufkin Foundry & Machine Co. 93
Mack Motor Truck Corp. 94
Minneapolis-Moline Co. 94
Murphy Diesel Co. 94
National Supply Co. 94
Superior Engines 94
Atlas Engines 94
Lister Engines 94
Nordberg Mfg. Co. 95
Palmer Engine Corp. 95
Rathbun-Jones Engineering Co. 95
R. H. Sheppard Co., Inc. 96
Sterling Engine Co. 96
Sun Shipbuilding & Dry Dock Co. 96
Union Diesel Engine Co. 96
Washington Iron Works 97
Waukesha Motor Co. 97
White-Roth Machine Co. 97
Witte Engine Works 97
Wolverine Motor Works, Inc. 98
Worthington Corp. 98

Foreign Diesel Engines Being Actively Sold in This Country

Brush ABOE, Inc. 98
Bamfords 99
Burmeister and Wain American Corp. 99
Crofton Industrial Diesel Engines 99
Klockner-Humboldt-Deutz 99
M.A.N. 100
Mercedes-Benz 100
Sulzer Bros., Ltd. 100

THIS year's Engine Specifications have been expanded to include gas engines. This is desirable since many basic engine models are built as diesel or natural gas engines, with all the variations in between. It entailed some basic listing changes and due to the increase in listings, made some consolidation necessary.

The objective of the Specifications is to provide a compact, though comprehensive, listing of engines for purposes of comparison and preliminary selection. Data must therefore be presented as uniformly as possible. Consultation with users of the Specifications to determine their needs was the method of approach to development of a standard format.

The broad range of models, types, sizes and applications makes some sacrifice in minor details necessary. For example, a basic engine may have been previously listed two, three or four times, each listing being for a different application. Sometimes only the model number, the dimensions, and weights would vary. In other cases, different speed and horsepower ratings would be given. In line with the objective, the present plan is to list the engine once with the range of horsepower and speeds given, and with dimensions and weights being for the basic engine with normal accessories.

Two new columns had to be added, "Type" and "Ignition". "Type" refers to the various executions of the same basic engine—diesel, dual-fuel and/or natural gas engine. A code letter has been set up to show the types built. Where an engine is built in three versions the columns will show both the injection system and the type of ignition. Obviously, only one or the other applies. Similarly, when such an engine model is listed for both marine and stationary service, the dual-fuel or gas executions apply only for the stationary application. A little thought will resolve seeming contradictions.

We have stated our objective and our plans for implementing it; we think it will make a better listing.

SYMBOL MEANINGS

Use

M—Marine propulsion service
S —Stationary service implying permanence of installation
P —Mobile, portable, or transportational service

Type

A —Diesel
B —Spark ignition natural gas engine
C—Diesel and dual-fuel
D —Diesel, dual-fuel, and natural gas engine

Starting System

A —Air starting
E —Electric starting
G—Gasoline engine starting
H—Hand cranking

Fuel System

O—Own manufacture
B —American Bosch
S —Bendix-Scintilla
R —Roosa-Master
D —Demco
A —Adeco

Ignition

B —Battery system
LM—Low tension magneto
HM—High tension magneto
P —Pulse generator

Supercharging Systems

M—Mechanical
T —Turbocharger

Reverse Gears

D —Direct reversing
S —Snow-Nabstedt
T —Twin Disc
C —Capitol
W—Western Gear
P —Paragon
O—Own manufacture
F —Falk

Notes:
Model numbers are for basic engines and may vary for other ratings and uses.
Dimensions are given to the next largest inch.
Dimensions and weights are for basic model unless otherwise indicated.

American Locomotive Company
30 Church Street, New York, N.Y.

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
6-9 x 10½	A	M-S-P	4	6	9 x 10½	550–800	720–1000	B	....	E-A	T	*	144	60	89	21350
12-9 x 10½	A	M-S-P	4	12	9 x 10½	1100–1600	720–1000	B	....	E-A	T	*	156	69	84	31365
16-9 x 10½	A	M-S-P	4	16	9 x 10½	1470–2250	720–1000	B	....	E-A	T	*	189	69	84	37000
12½ x 13	C	S-P	4	6	12½ x 13	580–660	600–740	B	....	E-A	....	....	156	60	82	34000†
12½ x 13T	C	S-P	4	6	12½ x 13	810–1000	600–740	B	....	E-A	T	....	156	60	115	36000†
12½ x 13	C	S	4	8	12½ x 13	775–865	600–720	B	....	A	....	....	200	60	96	49000
12½ x 13T	C	S	4	8	12½ x 13	1080–1300	600–720	B	....	A	T	....	225	60	115	50000

* *Make not known.* † *Dimensions and weight for portable unit.*

Baldwin-Lima-Hamilton Corp.
Hamilton, Ohio

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
T-495-SA	A	M-S-P	4	4	9½ x 12	530–700	720–950	D	....	A-E	T	C	107	51	88	19600
T-695-SA	A	M-S-P	4	6	9½ x 12	800–1050	720–950	D	....	A-E	T	C	134	51	80	22500
T-895-SA	A	M-S-P	4	8	9½ x 12	1060–1400	720–950	D	....	A-E	T	C	161	51	80	27000
606-NA	C	M-S	4	6	12¾ x 15½	430–750	360–625	B-S	....	A-E	....	D	159	76	91	35000
608-NA	C	M-S	4	8	12¾ x 15½	575–1000	360–625	B-S	....	A-E	....	D	195	76	91	43500
606-SC	C	M-S	4	6	12¾ x 15½	650–1320	360–625	B-S	....	A-E	T	D	170	86	91	36500
608-SC	C	M-S	4	8	12¾ x 15½	865–1750	360–625	B-S	....	A-E	T	D	212	89	91	45000
521-SA*	C	M-S	2	5	21½ x 27½	2400	257	B	....	A	....	D	267	80	161	175000
621-SA	C	M-S	2	6	21½ x 27½	2900	257	B	....	A	....	D	304	80	161	205000
721-SA	C	M-S	2	7	21½ x 27½	3400	257	B	....	A	....	D	341	80	161	233000
821-SA	C	M-S	2	8	21½ x 27½	3850	257	B	....	A	....	D	378	80	161	262500
921-SA	C	M-S	2	9	21½ x 27½	4350	257	B	....	A	....	D	415	80	161	292000
1021-SA	C	M-S	2	10	21½ x 27½	4850	257	B	....	A	....	D	478	80	161	321000
1221-SA	C	M-S	2	12	21½ x 27½	5450	257	B	....	A	....	D	552	80	161	380000
324-DA*	A	M-S	2	3	24 x 36	1585–3000	100–180	O	....	A	....	D	....	....	....	.....
424-DA	A	M-S	2	4	24 x 36	2115–4000	100–180	O	....	A	....	D	310	111	236	.....
524-DA	A	M-S	2	5	24 x 36	2640–5000	100–180	O	....	A	....	D	356	111	236	441000
624-DA	A	M-S	2	6	24 x 36	3170–6000	100–180	O	....	A	....	D	402	111	236	514000
724-DA	A	M-S	2	7	24 x 36	3700–7000	100–180	O	....	A	....	D	447	111	236	588000
824-DA	A	M-S	2	8	24 x 36	4225–8000	100–180	O	....	A	....	D	492	111	236	661000
924-DA	A	M-S	2	9	24 x 36	4750–9000	100–180	O	....	A	....	D	538	111	236	735000
1024-DA	A	M-S	2	10	24 x 36	5280–10000	100–180	O	....	A	....	D	583	111	236	808000

* *SA indicates single acting; DA indicates double acting.* *Weights are net for engine only.*

The Buda Company
Harvey, Illinois

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
IBD38	A	S	4	1	3⅛ x 4⅛	6.7	1800	B	....	E	....	....	39	23	40	795*
2BD77	A	M-S-P	4	2	3⅛ x 4⅛	13.4–15.8	1800–2000	B	....	E	....	S	22	23	31	500*
4BD153	A	M-S-P	4	4	3⅛ x 4⅛	28–34	2000–2400	B	....	E	....	S	31	23	31	680*
6BD230	A	M-S-P	4	6	3⅛ x 4⅛	42–60	2000–2400	B	....	E	....	S	39	23	31	850*
4BD182	A	M-S-P	4	4	3⅜ x 4⅛	32–39	1800–2400	B	....	E	....	S	31	23	31	710*
6BD273	A	M-S-P	4	6	3⅜ x 4⅛	50–65	1800–2400	B	....	E	....	S	39	23	31	890*
6DAM273	A	M	4	6	3⅜ x 4⅛	85	2800	B	....	E	....	S	57	24	32	995
6DT317	A	M-S-P	4	6	3⅝ x 5⅛	56–79	1800–2300	B	....	E	....	S	42	28	41	1150*
6DT468	A	M-S-P	4	6	4¼ x 5½	76–96	1600–2000	B	....	E	....	S	48	27	40	1245*
6DTS468	A	P	4	6	4¼ x 5½	135	2400	B	....	E	M	....	48	34	42	1565
6DAS516	A	P	4	6	4⅛ x 5⅝	165	2400	B	....	E	M	....	48	34	48	1625
6DA779	A	S-P	4	6	5¼ x 6	120–165	1400–1900	B	....	E	....	....	59	30	49	2552*
6DA844	A	M-S-P	4	6	5¼ x 6½	140–190	1200–1950	B	....	E	....	S	59	30	49	2630*
6DAS844	A	M-S-P	4	6	5¼ x 6½	155–245	1400–1950	B	....	E	M	S	59	35	49	2674*
8DA1125	A	M-S-P	4	8	5¼ x 6½	171–250	1400–1950	B	....	E	....	S	76	30	51	3400*
8DAS1125	A	M-S-P	4	8	5¼ x 6½	192–300	1400–1950	B	....	E	M	S	78	34	51	3580*
4DC645	A	S	4	4	5⅝ x 6½	97	1400	B	....	E	....	....	79	38	64	3380
6DC970	A	S-P	4	6	5⅝ x 6½	140–178	1400–1800	B	....	E	....	....	59	30	49	2600*
8DC1290	A	S-P	4	8	5⅝ x 6½	190–243	1400–1800	B	....	E	....	....	76	30	51	3450*
6DC1879	A	M-S-P	4	6	6¾ x 8¾	171–232	900–1200	B	....	A-E	....	S	96	54	65	6925*
6DCS1879	A	M-P	4	6	6¾ x 8¾	284	1200	B	....	A-E	M	S	100	54	65	7900*
8DC2505	A	M-S	4	8	6¾ x 8¾	216–325	900–1200	B	....	A-E	....	W	149	52	92	12840**
8DCS2505	A	M-S	4	8	6¾ x 8¾	320–430	900–1200	B	....	A-E	M	W	158	64	92	13240**
4B153	B	S-P	4	4	3⅛ x 4⅛	41	2000	..	B-HM	E	....	....	51	23	39	780
4B182	B	S-P	4	4	3⅜ x 4⅛	46	2000	..	B-HM	E	....	....	51	23	39	780
6B230	B	S-P	4	6	3⅛ x 4⅛	57.5	2000	..	B-HM	E	....	....	57	23	39	960
6B273	B	S-P	4	6	3⅜ x 4⅛	69	2000	..	B-HM	E	....	....	57	23	39	960
HP326	B	S-P	4	6	3 13/16 x 4¼	69	1800	..	B-HM	E	....	....	61	27	46	1164
HP351	B	S-P	4	6	3 13/16 x 5⅛	74	1800	..	B-HM	E	....	....	61	27	46	1164
K428	B	S-P	4	6	4⅛ x 4¾	97	1800	..	B-HM	E	....	....	71	32	52	1810
L525	B	S-P	4	6	4½ x 5½	96	1600	..	B-HM	E	....	....	71	32	52	1860
LO525	B	S-P	4	6	4½ x 5½	118.5	1600	..	B-HM	E	....	....	73	30	53	2050
6MO672	B	S-P	4	6	4⅞ x 6	132	1400	..	B-HM	E-G	....	....	95	39	64	3750
6MO893	B	S-P	4	6	5⅝ x 6	174	1400	..	B-HM	E-G	....	....	95	39	64	3815
6MO970	B	S-P	4	6	5⅝ x 6½	188	1400	..	B-HM	E-G	....	....	95	39	64	3830
8MO1290	B	S-P	4	8	5⅝ x 6½	261	1400	..	B-HM	E-G	....	....	111	46	74	5420
8MOS1290	B	S-P	4	8	5⅝ x 6½	283	1400	..	B-HM	E-G	M	....	112	52	75	5900
6PC1879	B	S-P	4	6	6¾ x 8¾	234	1000	..	B-HM	A-E-G	....	....	123	48	83	9100
6PCS1879	B	S-P	4	6	6¾ x 8¾	292	1000	..	B-HM	A-E-G	M	....	132	60	89	11050
8PC2505	B	S-P	4	8	6¾ x 8¾	362	1000	..	B-HM	A-E-G	....	....	141	64	93	12640
8PCS2505	B	S-P	4	8	6¾ x 8¾	440	1000	..	B-HM	A-E-G	M	....	150	64	88	14289

* *Weights and dimensions for portable units.* ** *Weights and dimensions for stationary units. All diesel engines have Lanova combustion system.*

Caterpillar Tractor Company
Peoria, Illinois

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
D-311	A	M-S-P	4	4	4 x 5	38–57	1600–2000	O	....	E-G	....	T	58	27	51	1800
D-315	A	M-S-P	4	4	4½ x 5½	53–82	1600–2000	O	....	E-G	....	S-T	60	30	50	2200
D-318	A	M-S-P	4	6	4½ x 5½	80–107	1600–2000	O	....	E-G	....	S-T	67	31	50	3100
D-326	A	M-S-P	4	6	5⅛ x 6	121–170	1600–2000	O	....	A-E-G	....	S	72	36	52	3655

(Caterpillar engine specifications continued on next page)

Caterpillar Tractor Co. *(Continued from preceding page)*

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
D-337	A	M-S-P	4	6	5½ x 6	170–250	1600–2000	O	....	A-E-G	M	S	72	37	68	4030
D-8800	A	M-S-P	4	4	5¾ x 8	82–102	1000	O	....	A-E-G	....	S-T	67	39	67	4275
D-13000	A	M-S-P	4	6	5¾ x 8	120–151	1000	O	....	A-E-G	....	S-T	85	43	67	5225
D-17000	A	M-S-P	4	V-8	5¾ x 8	150–200	1000	O	....	A-E-G	....	T	85	50	66	7515
D-364	A	M-S-P	4	V-8	5¾ x 8	215–265	1225	O	....	A-E	....	S-T	84	54	77	8250
D-375	A	M-S-P	4	V-8	5¾ x 8	270–335	1225	O	....	A-E	M	S	83	54	79	8655
D-386	A	M-S-P	4	V-12	5¾ x 8	320–400	1225	O	....	A-E	....	F	104	54	93	10800
D-397	A	M-S-P	4	V-12	5¾ x 8	400–500	1225	O	....	A-E	M	F	107	54	93	11315

High end of horsepower range is maximum. Lower end is for continuous, 24-hr. duty. D-397, D-375 & D-337 equipped with Roots blower. Weights and dimensions are for "S" & "P" units. Widths include sump pump handle extended, starting crank, etc. All engines available as electric sets. All engines have "Cat" fuel system—solid injection, precombustion chamber type.

Chicago Pneumatic Tool Company
6 East 44th Street, New York 17, N. Y.

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
39-CP	D	S	4	3	9 x 10½	145	720	S	LM	A	....	....	68	44	67	8900
49-CP	D	S	4	4	9 x 10½	195	720	S	LM	A	....	....	84	44	67	10690
69-CP	D	S	4	6	9 x 10½	290	720	S	LM	A	....	....	112	44	67	14240
89-CP	D	S	4	8	9 x 10½	390	720	S	LM	A	....	....	140	44	67	16750
412-CP	D	S	4	4	11 x 12	330	720	S	LM	A	....	....	106	47	95	21200
512-CP	D	S	4	5	11 x 12	415	720	S	LM	A	....	....	124	55	95	25300
612-CP	D	S	4	6	11 x 12	500	720	S	LM	A	....	....	143	55	95	28400
812-CP	D	S	4	8	11 x 12	665	720	S	LM	A	....	....	178	68	95	32800
614-CP	D	S	4	6	11 x 14¼	495	600	S	LM	A	....	....	143	55	95	29800
814-CP	D	S	4	8	11 x 14¼	655	600	S	LM	A	....	....	178	68	95	34500
460-CP	D	S	4	4	16 x 20	585	360	S	LM	A	....	....	171	85	125	64700
462-CP	D	S	4	4	16 x 22	585	327	S	LM	A	....	....	171	85	125	64700
560-CP	D	S	4	5	16 x 20	730	360	S	LM	A	....	....	197	85	125	72800
562-CP	D	S	4	5	16 x 22	730	327	S	LM	A	....	....	197	85	125	72800
660-CP	D	S	4	6	16 x 20	875	360	S	LM	A	....	....	223	85	125	80900
662-CP	D	S	4	6	16 x 22	870	327	S	LM	A	....	....	223	85	125	80900
860-CP	D	S	4	8	16 x 20	1170	360	S	LM	A	....	....	275	106	125	101440
862-CP	D	S	4	8	16 x 22	1170	327	S	LM	A	....	....	275	106	125	101440
69-CPS	D	S	4	6	9 x 10½	485	720	S	LM	A	T	....	156	58	84	15740
89-CPS	D	S	4	8	9 x 10½	585	720	S	LM	A	T	....	184	58	84	18250
412-CPS	D	S	4	4	11 x 12	500	720	S	LM	A	T	....	128	47	113	23400
512-CPS	D	S	4	5	11 x 12	620	720	S	LM	A	T	....	146	55	113	27500
612-CPS	D	S	4	6	11 x 12	745	720	S	LM	A	T	....	164	55	113	31600
812-CPS	D	S	4	8	11 x 12	1000	720	S	LM	A	T	....	215	68	113	35700
614-CPS	D	S	4	6	11 x 14¼	740	600	S	LM	A	T	....	164	55	113	32000
814-CPS	D	S	4	8	11 x 14¼	985	600	S	LM	A	T	....	215	68	113	36000
460-CPS	D	S	4	4	16 x 20	875	360	S	LM	A	T	....	210	85	125	68130
462-CPS	D	S	4	4	16 x 22	875	327	S	LM	A	T	....	210	85	125	68130
560-CPS	D	S	4	5	16 x 20	1100	360	S	LM	A	T	....	236	106	125	76540
562-CPS	D	S	4	5	16 x 22	1100	327	S	LM	A	T	....	236	106	125	76540
660-CPS	D	S	4	6	16 x 20	1315	360	S	LM	A	T	....	262	106	125	84950
662-CPS	D	S	4	6	16 x 22	1315	327	S	LM	A	T	....	262	106	125	84950
860-CPS	D	S	4	8	16 x 20	1750	360	S	LM	A	T	....	320	116	125	106800
862-CPS	D	S	4	8	16 x 22	1750	327	S	LM	A	T	....	320	116	125	106800

Clark Bros. Co.
Olean, New York

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
RAD2	A	S	2	2	14 x 14	200	330	B-S	....	A	....	....	...	...	...	28700
RAD32	A	S	2	8	14 x 14	300	330	B-S	....	A	....	....	...	...	...	33850
RAD4	A	S	2	4	14 x 14	400	330	B-S	....	A	....	....	...	...	...	42700
RAD5	A	S	2	5	14 x 14	500	330	B-S	....	A	....	....	...	...	...	52700
RAD6	A	S	2	6	14 x 14	600	330	B-S	....	A	....	....	...	...	...	65550
RAD8	A	S	2	8	14 x 14	800	330	B-S	....	A	....	....	...	...	...	70400
DG4	A	M-S	2	4	12½ x 16	380–500	300–400	B-S	....	A	....	....	...	...	...	42000*
DG5	A	S	2	5	12½ x 16	475–675	300–400	B-S	....	A	....	....	...	...	...	.....
DG6	A	M-S	2	6	12½ x 16	570–750	300–400	B-S	....	A	....	....	...	...	...	56000*
DG8	A	S	2	8	12½ x 16	760–1000	300–400	B-S	....	A	....	....	...	...	...	.....
HMA-2	B	S-P†	2	2	8¼ x 8¼	85	600	..	LM	A	....	....	...	...	...	.....
HMA-4	B	S-P†	2	4	8¼ x 8¼	175	600	..	LM	A	....	....	...	...	...	.....
HMA-6	B	S-P†	2	6	8¼ x 8¼	265	600	..	LM	A	....	....	...	...	...	.....
HMA-8	B	S-P†	2	8	8¼ x 8¼	350	600	..	LM	A	....	....	...	...	...	.....
HMA-10	B	S-P†	2	10	8¼ x 8¼	440	600	..	LM	A	....	....	...	...	...	.....
HSRA-3	B	S	2	3	14 x 14	440	330	..	LM	A	M	....	...	...	...	.....
HSRA-4	B	S	2	4	14 x 14	600	330	..	LM	A	M	....	...	...	...	.....
HSRA-5	B	S	2	5	14 x 14	725	330	..	LM	A	M	....	...	...	...	.....
HSRA-6	B	S	2	6	14 x 14	880	330	..	LM	A	M	....	...	...	...	.....
HSRA-8	B	S	2	8	14 x 14	1200	330	..	LM	A	M	....	...	...	...	.....
HRA-8	B	S	2	8	14 x 14	1055	330	..	LM	A	....	....	...	...	...	.....
TRA-5	B	S	2	5	14 x 14	900	360	..	LM	A	T	....	...	...	...	.....
TRA-6	B	S	2	6	14 x 14	1090	360	..	LM	A	T	....	...	...	...	.....
TRA-7	B	S	2	7	14 x 14	1250	360	..	LM	A	T	....	...	...	...	.....
TRA-8	B	S	2	8	14 x 14	1440	360	..	LM	A	T	....	...	...	...	.....
TRA-10	B	S	2	10	14 x 14	1800	360	..	LM	A	T	....	...	...	...	.....
HBA-5	B	S	2	5	17 x 17	1200	330	..	LM	A	....	....	...	...	...	.....
HBA-6	B	S	2	6	17 x 17	1440	330	..	LM	A	....	....	...	...	...	.....
HBA-8	B	S	2	8	17 x 17	1920	330	..	LM	A	....	....	...	...	...	.....
HBA-10	B	S	2	10	17 x 17	2400	330	..	LM	A	....	....	...	...	...	.....
TLA-6	B	S	2	6	17 x 19	2000	300	..	LM	A	T	....	...	...	...	.....
TLA-7	B	S	2	7	17 x 19	2350	300	..	LM	A	T	....	...	...	...	.....
TLA-10	B	S	2	10	17 x 19	3300	300	..	LM	A	T	....	...	...	...	.....

** Marine weight. † Semi portable. All engines have open type combustion chambers.*

Climax Engine & Pump Mfg. Co.
Clinton, Iowa

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
D148	A	S	4	2	4¼ x 5¼	18	1200	B	....	E	....	....	32	26	44	1950
D297	A	S	4	4	4¼ x 5¼	36	1200	B	....	E	....	....	47	26	44	2950
R110	B	S-P	4	4	6¼ x 7	.....	900	..	B-HM	A-E-G	....	....	58	31	49	2450

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Supercharge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
R165	B	S-P	4	6	6½ x 7	.....	900	..	B-HM	A-E-G	....	....	74	30	51	3250
K67	B	S-P	4	6	7 x 7	.....	900	..	B-HM	A-E-G	....	....	71	30	58	5400
K75	B	S-P	4	6	7½ x 7	.....	900	..	B-HM	A-E-G	....	....	71	30	58	5400
V80	B	S	4	8	7 x 7	.....	900	..	B-HM	A-E-G	....	....	79	51	59	8400
V85	B	S	4	8	7½ x 7	.....	900	..	B-HM	A-E-G	....	....	79	51	59	8500
V122	B	S	4	12	7 x 7	.....	900	..	B-HM	A-E-G	....	....	103	51	59	11000
V125	B	S	4	12	7½ x 7	.....	900	..	B-HM	A-E-G	....	....	103	51	59	11600
C46	B	S	4	1	5 x 6¼	.....	600	..	HM	H-E-G	....	....	47	38	39	1360
C66	B	S	4	1	5¾ x 7½	.....	550	..	HM	H-E-G	....	....	53	40	44	1575
C96	B	S	4	1	7 x 8½	.....	500	..	HM	H-E-G	....	....	63	47	49	2580

Continental Motors Corporation
Muskegon, Michigan

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Supercharge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
GD-157	A	S	4	4	3⅝ x 4⅝	39*	2000	B-R	....	E	....	....	32	16	31	605
ED-201	A	S	4	4	3⅝ x 4½	60.5*	2400	B	....	E	....	....	...	...	...	.....
HD-260	A	S	4	4	3⅞ x 5½	59.3*	2000	B-R	....	E	....	....	34	22	35	840
SD-382	A	S	4	4	4½ x 6¼	66*	1500	B	....	E	....	....	48	22	38	1250
TD-427	A	S	4	6	4⅛ x 4⅞	106.5*	2000	B	....	E	....	....	48	22	38	1300
RD-572	A	S	4	6	4¾ x 5⅜	142.5*	2000	B	....	E	....	....	52	28	45	1845
SD-802	A	S	4	6	5⅛ x 5½	185*	1800	B	....	E	....	....	66	35	59	2150
TD-6427	A	P	4	6	4⅛ x 4⅞	116*	2400	B	....	E	....	....	47	21	37	1270
RD-6572	A	P	4	6	4¾ x 5⅜	162*	2400	B	....	E	....	....	58	21	42	1785
SD-6802	A	P	4	6	5⅛ x 5½	217*	2200	B	....	E	....	....	...	...	...	.....
Y-69	B	S-P	4	4	2½ x 3½	16.3*	2000	..	B-LM-HM	E	....	....	26	15	26	265
Y-112	B	S-P	4	4	3⅛ x 3½	28*	2000	..	B-LM-HM	E	....	....	26	15	26	265
F-162	B	S-P	4	4	3⅞ x 4⅜	38*	2000	..	B-LM-HM	E	....	....	29	16	29	370
F-226	B	S-P	4	6	3⅛ x 4⅜	53*	2000	..	B-LM-HM	E	....	....	36	16	29	510
M-330	B	S-P	4	6	4 x 4⅝	78.5*	2000	..	B-LM-HM	E	....	....	43	22	34	720
B-427	B	S-P	4	6	4⅛ x 4⅞	101.5*	2000	..	B-LM-HM	E	....	....	46	22	34	875
R-501	B	S-P	4	6	4½ x 5¼	129*	2000	..	B-LM-HM	E	....	....	52	28	45	1670
R-602	B	S-P	4	6	4⅞ x 5⅝	152*	2000	..	B-LM-HM	E	....	....	52	28	45	1670
S-749	B	S-P	4	6	5⅜ x 5½	190*	2000	..	B-LM-HM	E	....	....	58	28	48	1910

* Bare Engine Rating.

The Cooper-Bessemer Corporation
Mt. Vernon, Ohio

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Supercharge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
FW6	A	M-S-P	4	6	9 x 10½	430	1000	S	....	A	....	O	130	35	80	17800
FW6T	A	M-S-P	4	6	9 x 10½	835	1000	S	....	A	T	O	176	35	80	18300
FVA8	A	M-S-P	4	8	9 x 10½	575	1000	S	....	A	....	O	102	44	58	22000
FVA8T	A	M-S-P	4	8	9 x 10½	1110	1000	S	....	A	T	O	124	44	58	27240
FVA12	A	M-S-P	4	12	9 x 10½	860	1000	S	....	A	....	O	140	44	58	26000
FVA12T	A	M-S-P	4	12	9 x 10½	1670	1000	S	....	A	T	O	140	44	58	37800
FVA16	A	M-S-P	4	16	9 x 10½	1150	1000	S	....	A	....	O	165	44	58	32000
FVA16T	A	M-S-P	4	16	9 x 10½	2330	1000	S	....	A	T	O	165	44	58	46430
GS6	D	M-S	4	6	10½ x 13½	565	750	O	B	A	....	D	142	38	68	21500
GS6T	D	M-S	4	6	10½ x 13½	1090	750	O	B	A	T	D	174	38	68	22250
GS8	D	M-S	4	8	10½ x 13½	775	750	O	B	A	....	D	175	38	68	29500
GS8T	D	M-S	4	8	10½ x 13½	1460	750	O	B	A	T	D	206	38	68	30250
JS5	D	S	4	5	13 x 16	515	450	O	B	A	....	....	149	45	80	41000
JS6	D	M-S	4	6	13 x 16	705	514	O	B	A	....	D	171	45	80	44000
JS6T	D	M-S	4	6	13 x 16	1360	514	O	B	A	T	D	200	45	80	45000
JS7	D	S	4	7	13 x 16	820	514	O	B	A	....	....	193	45	80	48000
JS7T	D	S	4	7	13 x 16	1585	514	O	B	A	T	....	221	45	80	49000
JS8	D	M-S	4	8	13 x 16	935	514	O	B	A	....	D	210	45	80	51000
JS8T	D	M-S	4	8	13 x 16	1815	514	O	B	A	T	D	239	45	80	52000
LS6	D	M-S	4	6	15½ x 22	965	360	O	B	A	....	D	224	56	120	76000
LS6T	D	M-S	4	6	15½ x 22	1870	360	O	B	A	T	D	251	56	120	77000
LS7	D	S	4	7	15½ x 22	1125	360	O	B	A	....	....	248	56	120	91000
LS7T	D	S	4	7	15½ x 22	2180	360	O	B	A	T	....	270	56	120	92000
LS8	D	M-S	4	8	15½ x 22	1285	360	O	B	A	....	D	276	56	120	106000
LS8T	D	M-S	4	8	15½ x 22	2500	360	O	B	A	T	D	299	56	120	107000
LSV12	D	M-S	4	12	15½ x 22	1925	360	O	B	A	....	D	252	68	117	194500
LSV12T	D	M-S	4	12	15½ x 22	3740	360	O	B	A	T	D	300	68	117	197500
LSV16	D	M-S	4	16	15½ x 22	2565	360	O	B	A	....	D	307	68	117	232500
LSV16T	D	M-S	4	16	15½ x 22	5000	360	O	B	A	T	D	355	68	117	237500

Engines have open combustion chamber. Height is given above shaft. Width is between bolt centers. All weights and dimensions for stationary units.

Cummins Engine Company, Inc.
Columbus, Indiana

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Supercharge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
A-600	A	M-S-P	4	6	4 x 5	100	2200	O	....	E	....	T	48	27	37	1440†
HR-400	A	M-S-P	4	4	5⅛ x 6	110	1800	O	....	E	....	T	42	30	47	1640†
JS-600	A	M-P	4	6	4⅛ x 5	150	2500	O	....	E	M	....	47	25	40	1545†
H-600	A	M-S-P	4	6	4⅞ x 6	150	1800	O	....	E	....	T	57	50	46	2395†
HR-600	A	M-S-P	4	6	5⅛ x 6	165	1800	O	....	E	....	T	57	50	46	2400†
HRBB-600	A	P	4	6	5⅛ x 6	175	2000	O	....	E	....	....	61	30	49	2450†
HS-600	A	S-P	4	6	4⅞ x 6	200	1800	O	....	E	M	T	58	32	47	2580†
NH-600	A	M-S-P	4	6	5⅛ x 6	200	2100	O	....	E	....	T	59	41	63	2480†
NHH-600	A	P	4	6	5⅛ x 6	200	2100	O	....	E	....	....	64	55	23	2285†
HRS-600	A	M-S-P	4	6	5⅛ x 6	225	1800	O	....	E	M	T	58	32	47	2580†
NHS-600	A	M-S-P	4	6	5⅛ x 6	275	2100	O	....	E	M	C	59	41	61	2775
NHRS-600	A	M-S-P	4	6	5⅛ x 6	300	2100	O	....	E	M	C	59	41	61	2725†
NHHS-600	A	P	4	6	5⅛ x 6	275	2100	O	....	E	M	....	64	55	23	2580†
NVH-1200	A	M-S-P	4	12	5⅛ x 6	400	2100	O	....	E	....	S	73	41	55	4300†
NVHS-1200	A	M-S-P	4	12	5⅛ x 6	550	2100	O	....	E	M	S	73	42	55	4550†
VT-12	A	M-S-P	4	12	5⅛ x 6	600	2100	O	....	E	T	C	84	45	60	6120*
L-600	A	M-S	4	6	7 x 10	250	1000	O	....	A-E	....	C	92	44	58	7590*
LR-600	A	M-S	4	6	7¼ x 10	300	1100	O	....	A-E	....	C	92	44	58	7590*
LR-600GAS	B	S	4	6	7¼ x 10	315	1100	..	HM	A-E	....	....	92	44	58	7590*

All except "L" models suitable for automotive and other portable applications.
*† Automotive weight with all accessory equipment; also approx. weight of stationary engine w/o radiator or clutch and approx. weight of marine engine w/o reverse gear. * Stationary engine and approx. marine weight w/o reverse gear. Hp. and RPM are maximum ratings.*

Enterprise Engine & Machinery Co.
Subsidiary of General Metals Corp.
18th & Florida Streets, San. Francisco, Calif.

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
DM3	D	M-S-P	4	3	8 x 10	73–162	450–1000	S	LM	A-E	....	*	55	43	72	5600
DM4	D	M-S-P	4	4	8 x 10	97–216	450–1000	S	LM	A-E	....	*	67	43	72	7920
DM6	D	M-S-P	4	6	8 x 10	146–324	450–1000	S	LM	A-E	....	*	91	43	72	10800
DM36	D	M-S-P	4	6	8 x 10	274–609	450–1000	S	LM	A-E	T	*	91	43	72	11400
DM8	D	M-S-P	4	8	8 x 10	194–432	450–1000	S	LM	A-E	....	*	129	43	72	13600
DM38	D	M-S-P	4	8	8 x 10	366–812	450–1000	S	LM	A-E	T	*	136	43	72	14200
DG6	D	M-S-P	4	6	12 x 15	273–655	250–600	S	LM	A	....	D	149	47	96	33500
DG36	C	M-S-P	4	6	12 x 15	482–1157	250–600	S	....	A	T	D	149	47	96	34600
DG8	D	M-S-P	4	8	12 x 15	364–874	250–600	S	LM	A	....	D	183	47	96	42700
DG38	C	M-S-P	4	8	12 x 15	643–1542	250–600	S	....	A	T	D	183	47	96	44800
DQ6	D	M-S-P	4	6	16 x 20	647–971	250–375	S	LM	A	....	D	193	60	124	77300
DQ36	C	M-S-P	4	6	16 x 20	1142–1713	250–375	S	....	A	T	D	193	60	124	79500
DQ8	D	M-S-P	4	8	16 x 20	863–1294	250–375	S	LM	A	....	D	241	60	124	95400
DQ38	C	M-S-P	4	8	16 x 20	1523–2284	250–375	S	....	A	T	D	241	60	124	97800
DR6	D	M-S-P	4	6	17 x 21	767–1151	250–375	S	LM	A	....	D	193	60	124	77300
DR36	C	M-S-P	4	6	17 x 21	1354–2031	250–375	S	....	A	T	D	193	60	124	79500
DR8	D	M-S-P	4	8	17 x 21	1023–1535	250–375	S	LM	A	....	D	241	60	124	95400
DR38	C	M-S-P	4	8	17 x 21	1805–2708	250–375	S	....	A	T	D	241	60	124	97800

Engines have open combustion chamber. Weights and dimensions are for statonary models with standard flywheel.
** Reverse & reduction gear used—make varies.*

Fairbanks, Morse & Company
600 S. Michigan Avenue, Chicago, Ill.

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
31A6¼	A	M-S-P	2	5	6¼ x 9	150–175	720	O	....	A	....	D	...	...	...	.....
31A6¼	A	M-S-P	2	6	6¼ x 9	180–210	720	O	....	A	....	D	...	...	...	.....
31A6¼	A	M-S-P	2	7	6¼ x 9	210–245	720	O	....	A	....	D	...	...	...	.....
31A6¼	A	M-S-P	2	8	6¼ x 9	240–280	720	O	....	A	....	D	...	...	...	.....
31A8½	C	M-S-P	2	5	8½ x 11	275–325	514–525	O	....	A	....	D	...	...	...	.....
31A8½	C	M-S-P	2	6	8½ x 11	330–390	514–525	O	....	A	....	D	...	...	...	.....
31A8½	C	M-S-P	2	7	8½ x 11	385–455	514–525	O	....	A	....	D	...	...	...	.....
31A8½	C	M-S-P	2	8	8½ x 11	440–520	514–525	O	....	A	....	D	...	...	...	.....
31A18	C	S	2	6	18 x 27	2100	277	O	....	A	....	....	...	...	...	.....
31A18	C	S	2	8	18 x 27	2800	277	O	....	A	....	....	...	...	...	.....
31A18	C	S	2	10	18 x 27	3500	277	O	....	A	....	....	...	...	...	.....
32E12	A	S	2	2	12 x 15	120	360	O	....	A	....	....	...	...	...	.....
32E12	A	S	2	3	12 x 15	180	360	O	....	A	....	....	...	...	...	.....
32E14	A	S	2	2	14 x 17	150	300	O	....	A	....	....	...	...	...	.....
32E14	A	S	2	3	14 x 17	225	300	O	....	A	....	....	...	...	...	.....
32E14	A	S	2	4	14 x 17	300	300	O	....	A	....	....	...	...	...	.....
32E14	A	S	2	5	14 x 17	375	300	O	....	A	....	....	...	...	...	.....
32E14	A	S	2	6	14 x 17	450	300	O	....	A	....	....	...	...	...	.....
33F12	A	S	2	5	12 x 15	500	400	O	....	A	....	....	...	...	...	.....
33F12	A	S	2	6	12 x 15	600	400	O	....	A	....	....	...	...	...	.....
33F14	A	S	2	5	14 x 17	575	300	O	....	A	....	....	...	...	...	.....
33F14	A	S	2	6	14 x 17	690	300	O	....	A	....	....	...	...	...	.....
33F14	A	S	2	7	14 x 17	805	300	O	....	A	....	....	...	...	...	.....
33F16	C	S	2	4	16 x 20	800	300	O	....	A	....	....	...	...	...	.....
33F16	C	S	2	5	16 x 20	1000	300	O	....	A	....	....	...	...	...	.....
33F16	C	S	2	6	16 x 20	1200	300	O	....	A	....	....	...	...	...	.....
33F16	C	S	2	7	16 x 20	1400	300	O	....	A	....	....	...	...	...	.....
33F16	C	S	2	8	16 x 20	1600	300	O	....	A	....	....	...	...	...	.....
33F16	C	S	2	10	16 x 20	2000	300	O	....	A	....	....	...	...	...	.....
37F12	A	M	2	5	12 x 15	500	400	O	....	A	....	D	...	...	...	.....
37F12	A	M	2	6	12 x 15	600	400	O	....	A	....	D	...	...	...	.....
37E14	A	M	2	5	14 x 17	575	300	O	....	A	....	D	...	...	...	.....
37E14	A	M	2	6	14 x 17	690	300	O	....	A	....	D	...	...	...	.....
37E14	A	M	2	7	14 x 17	805	300	O	....	A	....	D	...	...	...	.....
37F16	A	M	2	5	16 x 20	1000	300	O	....	A	....	D	...	...	...	.....
37F16	A	M	2	6	16 x 20	1200	300	O	....	A	....	D	...	...	...	.....
37F16	A	M	2	7	16 x 20	1400	300	O	....	A	....	D	...	...	...	.....
37F16	A	M	2	8	16 x 20	1600	300	O	....	A	....	D	...	...	...	.....
37F16	A	M	2	10	16 x 20	2125	300	O	....	A	....	D	...	...	...	.....
38F5¼	D	M-S-P	2	4	5¼ x 7¼	150–330	600–1200	B	....	A-E	....	S	...	...	...	.....
38F5¼	D	M-S-P	2	5	5¼ x 7¼	188–413	600–1200	B	....	A-E	....	S	...	...	...	.....
38F5¼	D	M-S-P	2	6	5¼ x 7¼	225–495	600–1200	B	....	A-E	....	S	...	...	...	.....
38F5¼	D	M-S-P	2	7	5¼ x 7¼	263–578	600–1200	B	....	A-E	....	S	...	...	...	.....
38F5¼	D	M-S-P	2	8	5¼ x 7¼	300–660	600–1200	B	....	A-E	....	S	...	...	...	.....
38F5¼	D	M-S-P	2	10	5¼ x 7¼	375–825	600–1200	B	....	A-E	....	F	...	...	...	.....
38D8½	D	M-S-P	2	4	8½ x 10	400–800	450–900	O	....	A	....	D	...	...	...	.....
38D8½	D	M-S-P	2	5	8½ x 10	500–1000	450–900	O	....	A	....	D	...	...	...	.....
38D8½	D	M-S-P	2	6	8½ x 10	600–1200	450–900	O	....	A	....	D	...	...	...	.....
39D8½	D	M-S-P	2	8	8½ x 10	800–1600	450–900	O	....	A	....	D	...	...	...	.....
38D8½	D	M-S-P	2	10	8½ x 10	1000–2000	450–900	O	....	A	....	D	...	...	...	.....
38D8½	D	M-S-P	2	12	8½ x 10	1200–2400	450–900	O	....	A	....	D	...	...	...	.....
45B3½	A	S	4	1	3½ x 4	5¼	1800	D	....	H-E	....	....	...	...	...	.....
45B4½	A	S	4	1	4½ x 4½	10½	1800	D	....	H-E	....	....	...	...	...	.....
48A3	A	M-S	4	1	3 x 4	3½	1800	O	....	E	....	S-T	...	...	...	.....
48A3½	A	M-S	4	2	3½ x 4	13½	1800	O	....	E	....	S-T	...	...	...	.....
48A4	A	S-P	4	1	4 x 5	8–10	1200–1800	O	....	E	....	S-T	...	...	...	.....
48A4	A	M-S-P	4	2	4 x 5	16–20	1200–1800	O	....	H-E	....	S-T	...	...	...	.....
48A4	A	M-S-P	4	3	4 x 5	25–30	1200–1800	O	....	H-E	....	S-T	...	...	...	.....
48A4	A	M-S-P	4	6	4 x 5	50–61	1200–1800	O	....	E	....	S-T	...	...	...	.....
48A4¼	A	S-P	4	1	4¼ x 5	9–11	1200–1800	O	....	E	....	S-T	...	...	...	.....
48A4¼	A	M-S-P	4	2	4¼ x 5	18–22	1200–1800	O	....	H-E	....	S-T	...	...	...	.....
48A4¼	A	M-S-P	4	3	4¼ x 5	28–34	1200–1800	O	....	H-E	....	S-T	...	...	...	.....
48A4¼	A	M-S-P	4	6	4¼ x 5	56–67	1200–1800	O	....	E	....	S-T	...	...	...	.....
49A4½	A	M-S-P	2	1	4½ x 5½	20	1200	B-S	....	E	....	S-T	...	...	...	.....
49A4½	A	M-S-P	2	2	4½ x 5½	40	1200	B-S	....	E	....	S-T	...	...	...	.....
49A4½	A	M-S-P	2	3	4½ x 5½	60	1200	B-S	....	E	....	S-T	...	...	...	.....
49A4½	A	M-S-P	2	4	4½ x 5½	80	1200	B-S	....	E	....	S-T	...	...	...	.....
49A4½	A	M-S-P	2	6	4½ x 5½	120	1200	B-S	....	E	....	S-T	...	...	...	.....

General Motors Corporation
Cleveland Diesel Engine Division
Cleveland, Ohio

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
3–268A	A	M-S	2	3	6½ x 7	150	1200	O	....	A-E	....	....	62	41	39*	4600
4–268A	A	M-S	2	4	6½ x 7	250	1200	O	....	A-E	....	F	72	41	39*	5400

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
6-268A	A	M-S	2	6	6½ x 7	375	1300	O	....	A-E	....	F	97	41	48**	6800
8-268A	A	M-S	2	8	6½ x 7	500	1300	O	....	A-E	....	F	117	41	48**	8800
6-278A	A	M-S	2	6	8¾ x 10½	615	750	O	....	A-E	....	F	107	54	72**	15500
8-278A	A	M-S	2	8	8¾ x 10½	820	750	O	....	A-E	....	F	124	54	72**	18800
12-278A	A	M-S	2	12	8¾ x 10½	1230	750	O	....	A-E	....	F	163	54	72**	24600
16-278A	C	M-S	2	16	8¾ x 10½	1640	750	O	....	A-E	....	F	204	54	72**	29500
16-358†	D	M-S	2	16	12½ x 14½	3000	600	O	B	E	....	F	148	141	201	62000

*† Vertical or horizontal. Heights are above crankcase. * Add 17 in. for cran kcase. ** Add 21 in. for crankcase. Dimensions and weights are for basic engine.*

General Motors Corporation
Detroit Diesel & Engine Division
Detroit, Michigan

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
2-51	A	M-S-P	2	2	4.1 x 4.1	27-35	2200	O	....	E	M**	S	28	26	33	820
4-51	A	M-S-P	2	4	4.1 x 4.1	54-87	2200-3000	O	....	E	M**	P	39	27	34	1180
3-71	A	M-S-P	2	3	4.25 x 5	61-101	1600-2100	O	....	E	M**	O	42	30	45	1575
4-71	A	M-S-P	2	4	4.25 x 5	83-138	1600-2100	O	....	E	M**	O	48	30	45	1750
4-71†	A	M	2	4	4.25 x 5	138	2100	O	....	E	M**	O	60	39	33	1920
6-71	A	M-S-P	2	6	4.25 x 5	131-216	1600-2100	O	....	E	M**	O	60	30	45	2135
6-71†	A	M	2	6	4.25 x 5	216	2100	O	....	E	M**	O	71	39	35	2270
Twin 4-71	A	S-P	2	8	4.25 x 5	167	1600	O	....	E	M**	...	83	56	58	4820
Twin 6-71	A	M-S-P	2	12	4.25 x 5	256-432	1600-2100	O	....	E	M**	O	95	56	58	5620
Twin 6-71*	A	M	2	12	4.25 x 5	266-432	1600-2100	O	....	E	M**	O	129	41	62	7550
Quad 6-71	A	M-S-P	2	24	4.25 x 5	512-864	1600-2100	O	....	E	M**	O	182	58	59	12425
6-110	A	M-S-P	2	6	5 x 5.6	205-289	1600-2000	O	....	E	M**	O	70	24	50	2960
Twin 6-110	A	S-P	2	12	5 x 5.6	416	1800	O	....	E	M**	....	124	66	87	12220
Twin 6-110*	A	M	2	12	5 x 5.6	409-578	1600-2000	O	....	E	M**	O	146	62	69	11000

** Tandem arrangement. ** Pressure Scavenging. † Inclined engine. Weights and dimensions are given for industrial ("S" & "P") units except on engines indicated as solely for marine application. Where a horsepower range is shown, high end is "Rated" (not continuous) brake horsepower for applications such as pleasure craft, fire boats and other intermittent operation. Weights and dimensions for marine engines vary with gear selected and on "Twins" and "Quads", radiators and power take-offs are included. Torque converters are available with industrial models.*

Electro-Motive Division, General Motors Corporation
LaGrange, Illinois

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
6-567C	A	S-P	2	6	8½ x 10	540-600	720-800	O	....	E	....	....	126	65	89	15000
8-567C	A	S-P	2	8	8½ x 10	720-900	720-835	O	....	E	....	....	142	63	89	18000
12-567C	A	S-P	2	12	8½ x 10	1080-1200	720-800	O	....	E	....	....	156	65	89	25000
16-567C	A	S-P	2	16	8½ x 10	1440-1750	720-835	O	....	E	....	....	215	63	89	31500

Engines are available for Marine use through Cleveland Diesel Engine Division, General Motors Corporation.

Gray Marine Motor Company
710 Canton Avenue, Detroit 7, Michigan

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
D157	A	M	4	4	3⅛ x 4⅜	30	1800	B	....	E	....	T-S	50	26	27	1100
D181	A	M	4	4	3½ x 4½	50	2400	R	....	E	....	P	55	21	33	750
D260	A	M	4	4	3⅞ x 5½	50	1800	B	....	E	....	T-S	56	22	35	1400
D427	A	M	4	6	4⅛ x 4⅞	100	2200	B	....	E	....	P-S	61	32	35	1500
D572	A	M	4	6	4¾ x 5¾	140	2200	B	....	E	....	P-T	72	23	40	2400

All data is for complete marine units.

Hallett Manufacturing Company
1601 W. Florence Avenue, Inglewood, California

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
AC1	A	S	4	1	3½ x 3⅝	5.5	1800	B	....	H-E*	....	....	27	15	24	220
AC2	A	S	4	2	3½ x 3⅝	13	1800	B	....	H-E*	....	...	34	25	25	350
D1	A	M-S	4	1	3⅞ x 4½	8	1500	B	....	H-E*	....	S	24	20	36	450
D2	A	M-S	4	2	3⅞ x 4½	18	1500	B	....	E	....	S	32	28	32	566
WC1	A	S	4	1	3½ x 3⅝	6	1800	B	....	H-E*	....	...	27	15	24	250
WC2	A	M-S	4	2	3½ x 3⅝	12-13	1800	B	....	H-E*	....	S	34	25	25	375
WC4S	A	M-S	4	4	3½ x 3⅝	25	1800	B	....	E	....	S	32	27	28	535

*Engines have open combustion chamber. * Model designation refers to hand starting—"S" is added to indicate electric starting; "M" indicates marine adaption. Dimensions and weights are for basic engine.*

P & H Diesel Engine Division, Harnischfeger Corporation
500 South Main Street, Crystal Lake, Illinois

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
287C-18	A	M-P	2	2	4½ x 5½	55	1800	B-D-S	....	E	M	S-T-W	33	29	41	1030
387C-18	A	M-P	2	3	4½ x 5½	90	1800	B-D-S	....	E	M	S-T-W	39	29	41	1350
487C-18	A	M-P	2	4	4½ x 5½	128	1800	B-D-S	....	E	M	S-T-W	46	29	41	1530
687C-18	A	M-P	2	6	4½ x 5½	180	1800	B-D-S	....	E	M	S-T-W	60	29	41	1900

Weights shown are for "P" units.

Hercules Motors Corporation
Canton, Ohio

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Supercharge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
DIX83	A	M-S-P	4	2	3⅝ x 4	24¼	2200	R-B	....	H-E	....	....	22	22	31	400
DIXC	A	M-S-P	4	2	4 x 4½	27.6	1800	B	....	E	....	....	22	20	21	550
DIXD	A	M	4	2	4¼ x 4	30	1800	..	....	E	....	....	42	23	21	870
DIXD	A	M-S-P	4	2	4¼ x 4½	30	1800	B	....	E	....	....	22	20	21	550
DIX4B	A	M-S-P	4	4	3¼ x 4	38.5	2200	B	....	E	....	....	31	22	19	600
DIX4D	A	M-S-P	4	4	3⅝ x 4	48.5	2200	R-B	....	E	....	....	31	22	19	600
DIX4E	A	M	4	4	3⅞ x 4	75	3000	..	....	E	....	....	45	28	21	890
DIX4ES	A	M	4	4	3⅞ x 4	95	3000	..	....	E	M	....	45	32	21	990
DOOB	A	M-S-P	4	4	3¾ x 4½	48	1800	R-B	....	E-G	....	....	30	23	20	750
DOOC	A	M-S-P	4	4	4 x 4½	55	1800	B	....	E-G	....	....	30	23	20	750
DOOD	A	M-S-P	4	4	4¼ x 4½	61.5	1800	R-B	....	E-G	....	....	30	23	20	750
DIX6D	A	M-S-P	4	6	3⅝ x 4	77.5	2200	R-B	....	E-G	....	....	39	24	19	800
DIX6-272	A	M-S-P	4	6	3 11/16 x 4¼	85	2200	R-B	....	A-E-G	....	....	39	24	38	800
DIX6E	A	M	4	6	3⅞ x 4	115	3000	..	....	E	....	....	54	31	21	1380
DIX6ES	A	M	4	6	3⅞ x 4	150	3000	..	....	E	M	....	54	34	21	1490
DJXB	A	M-S-P	4	6	3½ x 4½	60	1800	R-B	....	A-E-G	....	....	37	23	21	950
DJXC&H	A	M-S-P	4	6	3¾ x 4½	69-79	1800	R-B	....	A-E-G	....	....	37	23	21	950
DJXHF	A	M-S-P	4	6	3¾ x 4½	79	1800	R-B	....	A-E-G	....	....	39	34	13 x 11	950
DWXC	A	M-S-P	4	6	4 x 4¼	94	1800	R-B	....	A-E-G	....	....	41	27	24	1350
DWXD	A	M-S-P	4	6	4¼ x 4¼	107	1800	R-B	....	A-E-G	....	....	41	27	24	1350
DWXLD	A	M-S-P	4	6	4¼ x 5	112	1800	R-B	....	A-E-G	....	....	41	27	25	1350
DWXLDF	A	M-S-P	4	6	4¼ x 5	106	1800	R-B	....	A-E-G	....	....	37	37	9 x 9	1325
DWXE	A	M	4	6	4⅝ x 4¾	148	2600	..	....	E	....	....	67	33	24	2200
DWXETS	A	M	4	6	4⅝ x 4¾	198	2600	..	....	E	T	....	67	33	24	2400
DRXB	A	M-S-P	4	6	4⅜ x 5¼	106	1600	R-B	....	A-E-G	....	....	45	26	25	1600
DRX-501	A	M-S-P	4	6	4½ x 5¼	113	1600	R-B	....	A-E-G	....	....	47	26	39	1600
DRXC	A	M-S-P	4	6	4⅝ x 5¼	118	1600	R-B	....	A-E-G	....	....	45	26	25	1600
DFXB	A	M-S-P	4	6	5 x 6	160	1600	R-B	....	A-E-G	....	....	56	30	31	2500
DFXC	A	M-S-P	4	6	5¼ x 6	176	1600	R-B	....	A-E-G	....	....	56	30	31	2500
DFXD	A	M-S-P	4	6	5½ x 6	191	1600	R-B	....	A-E-G	....	....	56	30	31	2500
DFXE	A	M-S-P	4	6	5⅝ x 6	199	1600	R-B	....	A-E-G	....	....	56	30	31	2500
DFXETS	A	M-S-P	4	6	5⅝ x 6	258-318	1600-2000	R-B	....	A-E-G	T	....	75	28	52	2700
DFXH	A	M-S-P	4	6	5¾ x 6	220-260	1600-2100	R-B	....	A-E-G	....	....	56	30	32	2600
DFXHF	A	M-S-P	4	6	5¾ x 6	220	1600	R-B	....	A-E-G	....	....	51	49	18 x 15	2600
DIXV8-402	A	S-P	4	V-8	4 x 4	127	2200	R	....	A-E	....	....	39	33	20	1050
DNXV8C	A	M-S-P	4	V-8	6 x 6	298	1600	B	....	A-E-G	....	....	52	42	32	4200
DNXV8D	A	M-S-P	4	V-8	6¼ x 6	325-388	1600-2000	B	....	A-E-G	....	....	52	42	32	4200
DNXV8DTS	A	M-S-P	4	V-8	6¼ x 6	410-500	1600-1800	B	....	A-E-G	T	....	76	42	73	5000
BXB	B	S-P	4	2	2⅞ x 3	7.7	1800	..	B-HM	H-E	....	....	19	17	17	131
NXA	B	S-P	4	2	3 x 4	10.5	1800	..	B-HM	H-E	....	....	21	18	19	270
NXB	B	S-P	4	2	3¼ x 4	12.5	1800	..	B-HM	H-E	....	....	21	18	19	270
ZXA	B	S-P	4	4	2½ x 3	14.7	2500	..	B-HM	H-E	....	....	24	17	17	179
ZXB	B	S-P	4	4	2⅝ x 3	15.7	2500	..	B-HM	H-E	....	....	24	17	17	179
IXA	B	S-P	4	4	3 x 4	22.1	1800	..	B-HM	H-E	....	....	27	18	20	285
IXB	B	S-P	4	4	3¼ x 4	26.4	1800	..	B-HM	H-E	....	....	27	18	20	293
IXLB	B	S-P	4	4	3¼ x 4¼	28	1800	..	B-HM	H-E	....	....	27	18	20	293
JX4E	B	S-P	4	4	3½ x 4¼	34.8	1800	..	B-HM	H-E	....	....	32	21	25	470
JX4C	B	S-P	4	4	3¾ x 4¼	40.2	1800	..	B-HM	H-E	....	....	32	21	25	470
JX4D	B	S-P	4	4	4 x 4¼	45.5	1800	..	B-HM	H-E	....	....	32	21	25	470
QXA	B	S-P	4	6	3½ x 4⅛	37.8	1800	..	B-HM	H-E	....	....	36	18	21	440
QXB	B	S-P	4	6	3¼ x 4⅛	40.8	1800	..	B-HM	H-E	....	....	36	18	21	440
QXC	B	S-P	4	6	3⅝ x 4⅛	46	1800	..	B-HM	H-E	....	....	36	18	21	440
QXD	B	S-P	4	6	3⅞ x 4⅛	48.5	1800	..	B-HM	H-E	....	....	36	18	21	440
QXLD	B	S-P	4	6	3⅞ x 4¼	54.5	1800	..	B-HM	H-E	....	....	36	18	21	440
JXB	B	S-P	4	6	3½ x 4¼	55.2	1800	..	B-HM	H-E	....	....	39	19	25	605
JXC	B	S-P	4	6	3¾ x 4¼	60.4	1800	..	B-HM	H-E	....	....	39	19	25	605
JXD	B	S-P	4	6	4 x 4¼	69.7	1800	..	B-HM	H-E	....	....	39	19	25	605
JXLD	B	S-P	4	6	4 x 4½	77.6	1800	..	B-HM	H-E	....	....	39	19	25	630
WXC3	B	S-P	4	6	4¼ x 4½	86	1800	..	B-HM	H-E-A	....	....	43	24	29	820
WXLC	B	S-P	4	6	4 x 4¾	79	1800	..	B-HM	H-E-A	....	....	43	27	29	811
WXLC3	B	S-P	4	6	4¼ x 4¾	89	1800	..	B-HM	H-E-A	....	....	43	27	29	825
TDXB	B	S-P	4	6	4⅜ x 5¼	106	1800	..	B-HM	H-E-A	....	....	48	28	35	1220
TDXC	B	S-P	4	6	4½ x 5¼	111	1800	..	B-HM	H-E-A	....	....	48	28	35	1220
RXB	B	S-P	4	6	4½ x 5¼	98.5	1800	..	B-HM	H-E-A	....	....	47	27	33	1000
RXC & LC	B	S-P	4	6	4⅝ x 5¼	104-110.5	1800	..	B-HM	H-E-A	....	....	47	27	33	1010
RXLD & H	B	S-P	4	6	4¾ x 5¼	116.5-125	1800	..	B-HM	H-E-A	....	....	47	26	36	1195
HXB	B	S-P	4	6	5 x 6	120	1600	..	B-HM	H-E-A	....	....	56	30	41	1810
HXC	B	S-P	4	6	5¼ x 6	132.5	1600	..	B-HM	H-E-A	....	....	56	30	41	1810
HXD	B	S-P	4	6	5½ x 6	155	1600	..	B-HM	H-E-A	....	....	56	30	41	1830
HXE	B	S-P	4	6	5¾ x 6	176	1600	..	B-HM	H-E-A	....	....	56	30	41	1830

Engines have turbulence-chamber combustion system. Lengths measured from bellhousing face to front support. Heights measured from crankshaft to top of cylinder head cover. Weights are approximate and include engine with fuel handling equipment only and no other accessories not forming an integral part of the engine. Various mounting arrangements, flywheel housings, oil pans, manifolds, starting motor and generator locations are available to meet specific applications requirements.

Hill Diesel Engine Corporation
238 Mill Street
Lansing 3, Michigan

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Supercharge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
2R	A	M-S	4	2	3½ x 5½	9-17	800-1600	B	....	E	....	S	48	25	46	1380
4R	A	M-S	4	4	3½ x 5½	18-34	800-1600	B	....	E	....	S	60	25	46	1740
6R	A	M-S	4	6	3½ x 5½	27-54	800-1600	B	....	E	....	S-T	72	25	46	2535
4F	A	M-S	4	4	3¾ x 5½	20-40	800-1600	B	....	E	....	S	60	25	46	1740
6F	A	M-S	4	6	3¾ x 5½	29-61	800-1800	B	....	E	....	S	72	25	46	2535
6K	A	M-S	4	6	4¼ x 5½	38-78	800-1600	B	....	E	....	S	74	25	46	2650

Engines have pre-combustion system. Dimensions and weights given are for stationary power units.

Ingersoll-Rand Company
11 Broadway, New York 4, N. Y.

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Supercharge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
T	A	M-S-P	4	6	7 x 8½	220	1000	O	....	A-E	....	*	86	42	69	9300
TS	A	M-S-P	4	6	7 x 8½	285	1000	O	....	A-E	M	*	86	48	69	9500
TS	A	M-S-P	4	8	7 x 8½	380	1000	O	....	A-E	M	*	108	48	69	12200
S	A	M-S-P	4	5	10½ x 12	375	720	O	....	A-E	....	*	116	40	85	19500
S	A	M-S-P	4	6	10½ x 12	450	720	O	....	A-E	....	*	132	40	85	21500
S	A	M-S-P	4	7	10½ x 12	525	720	O	....	A-E	....	*	149	40	85	24300

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Supercharge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
S	A	M-S-P	4	8	10½ x 12	600	720	O	....	A-E	....	*	165	40	85	27800
SS	A	M-S-P	4	5	10½ x 12	580	720	O	....	A-E	T	*	116	40	85	20000
SS	A	M-S-P	4	6	10½ x 12	750	720	O	....	A-E	T	*	132	40	85	23600
SS	A	M-S-P	4	7	10½ x 12	825	720	O	....	A-E	T	*	149	40	85	27000
SS	A	M-S-P	4	8	10½ x 12	1000	720	O	....	A-E	T	*	165	40	85	30600

* Reverse & Reduction Gear—make not known.

International Harvester Co.
180 No. Michigan Avenue, Chicago 1, Illinois

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Supercharge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
UD-264	A	S-P	4	4	4 x 5¼	52	1600	O	....	E-G	....	....	63	27	47	1835
UD-350	A	S-P	4	4	4½ x 5½	75	1800	O	....	E-G	....	....	66	28	54	2185
UD-14A	A	S-P	4	4	4¾ x 6½	76	1400	O	....	E-G	....	....	78	34	57	2650
UD-525	A	S-P	4	6	4½ x 5½	115	1800	O	....	E-G	....	....	89	38	60	3350
UD-18A	A	S-P	4	6	4¾ x 6½	125	1600	O	....	E-G	....	....	96	36	60	4000
UD-24	A	S-P	4	6	5¾ x 7	180	1375	O	....	E-G	....	....	108	44	72	5805
U-1	B	S-P	4	4	2⅝ x 2¾	16.5	2500	..	HM	H-E	....	....	44	23	33	450
U-2A	B	S-P	4	4	3 x 4	24	1800	..	B	H-E	....	....	52	23	40	750
U-164	B	S-P	4	4	3½ x 4¼	36.5	1800	..	B	H-E	....	....	55	24	41	1015
U-264	B	S-P	4	4	4 x 5¼	52	1600	..	B	H-E	....	....	63	27	49	1500
U-9	B	S-P	4	4	4.4 x 5.5	55	1500	..	B	H-E	....	....	68	28	51	1825
U-220	B	S-P	4	6	3⅜ x 3 11/16	50.5	1800	..	B	H-E	....	....	65	28	50	1180
U-240	B	S-P	4	6	3⅜ x 4.018	55	1800	..	B	H-E	....	....	65	28	50	1195
U-269	B	S-P	4	6	3⅜ x 4½	61.7	1800	..	B	H-E	....	....	66	28	50	1340
U-372	B	S-P	4	6	4⅜ x 4½	83	1800	..	B	H-E	....	....	71	28	57	1724
U-406	B	S-P	4	6	4⅜ x 4½	90	1800	..	B	H-E	....	....	73	28	57	1763
U-450	B	S-P	4	6	4⅜ x 5	102	1800	..	B	H-E	....	....	73	28	57	1855
U-1791	B	S-P	4	6	5¾ x 7	187	1400	..	B	E	....	....	108	44	64	5210

Diesel engines: Horsepower shown is for complete power unit with radiator & fan as obtained at sea level with regular production injection pump setting. Dimensions include radiator and direct-drive rear power take-off.

Kahlenberg Brothers Company
Two Rivers, Wisconsin

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Supercharge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
AD	A	M-S	2	2	8½ x 9	30-36	400	O	....	A	....	O	...	...	...	5450
AT	A	M-S	2	3	8½ x 9	45-54	400	O	....	A	....	O-D	...	...	...	6500
AF	A	M-S	2	4	8½ x 9	60-70	400	O	....	A	....	O-D	...	...	...	8200
BD	A	M-S	2	2	10 x 10½	50-60	375	O	....	A	....	O	...	...	...	7300
BT	A	M-S	2	3	10 x 10½	90	375	O	....	A	....	†D	...	...	...	9700
BF	A	M-S	2	4	10 x 10½	120	375	O	....	A	....	†D	...	...	...	11980
B5	A	M-S	2	5	10 x 10½	150	375	O	....	A	....	†D	...	...	...	15650
B6	A	M-S	2	6	10 x 10½	180	375	O	....	A	....	D	...	...	...	17050
CT	A	M-S	2	3	12½ x 14	150	325	O	....	A	....	†D	...	...	...	21730
CF	A	M-S	2	4	12½ x 14	200	325	O	....	A	....	†D	...	...	...	23900
C5	A	M-S	2	5	12½ x 14	250	325	O	....	A	....	D	...	...	...	29000
C6	A	M-S	2	6	12½ x 14	300	325	O	....	A	....	D	...	...	...	34000

† *Own reverse gear optional.*

The Lathrop Engine Company
Mystic, Conn.

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Supercharge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
D-60	A	M	4	4	5½ x 7	60	900	B	....	E	....	O	75	29	31	3000
D-100	A	M	4	6	5½ x 7	100	1000	B	....	E	....	S	93	30	31	4000
DH-200	A	M	4	6	5¾ x 6	187	1600	B	....	E	....	C	96	39	44	5100
DIX4ECS	A	M	4	4	3⅞ x 4	95	3000	B	....	E	M	P	42	34	29	990
DIX6ECS	A	M	4	6	3⅞ x 4	150	3000	B	....	E	M	P	54	34	31	1490

LeRoi Company
Subsidiary of Westinghouse Air Brake Co.
1706 South 68th Street, Milwaukee 14, Wisconsin

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Supercharge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
D140	B	S-P	4	4	3½ x 3⅝	21.5	1200	..	HM*	E-H	....	....	51	24	44	700†
D176	B	S-P	4	4	3¾ x 4	28	1200	..	HM*	E-H	....	....	55	27	45	855†
D201	B	S-P	4	4	4 x 4	32	1200	..	HM*	E-H	....	....	54	27	54	851†
D226	B	S-P	4	4	4 x 4½	38	1200	..	HM*	E-H	....	....	57	24	36	1000†
A288	B	S	4	1	7¼ x 7	24.7	720	..	HM*	E-H	....	....	64	47	54	2300
A114	B	S	4	1	5¾ x 5¼	13.6	1000	..	HM*	E-H	....	....	47	49	51	1530
D471	B	S-P	4	4	5 x 6	70	1200	..	HM*	E	....	....	75	30	56	1950†
H540	B	S-P	4	8	4½ x 4½	147	2000	..	HM*	E	....	....	81	40	64	2000†
H844	B	S-P	4	8	5¼ x 4⅞	210	2000	..	HM*	E	....	....	88	50	74	2740†
F1500	B	S-P	4	6	6¾ x 7	190	1000	..	HM**	G-A	....	....	115	50	84	5800
H2000	B	S	4	8	6¾ x 7	252	1000	..	HM**	G-A	....	....	88	52	72	5850
L3000	B	S	4	12	6¾ x 7	380	1000	..	HM**	G-A	....	....	111	60	84	8350
L3460	B	S	4	12	7¼ x 7	560	1200	..	HM**	G-A	....	....	164	66	95	10400
L4000	B	S	4	12	7.54 x 7.5	635	1200	..	HM**	G-A	....	....	164	66	95	10400

* *Distributor available.* ** *LM available.* † *Lighter automotive units available. Weights are given for stationary units (dry).*

Lufkin Foundry & Machine Co.,
Lufkin, Texas

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Supercharge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
H333	B	S	2	2	5½ x 7	20-30	425-650	..	HM	E-A	....	....	59	53	52	2900
H795	B	S	2	2	7½ x 9	45-65	400-600	..	HM	E-A	....	....	76	68	60	4250

Mack Motor Truck Corporation
350 Fifth Ave., New York 1, N.Y.

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
END510	A	P	4	6	4 1/4 x 5 1/2	138	2400	B	....	E	....	....	49	28	45	1738*
END673	A	P	4	6	4 1/8 x 6	170	2100	B	....	E-A	....	....	51	27	45	1917*

** Bare engine.*

Minneapolis-Moline Company
Minneapolis 1, Minnesota

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
165-4	B	S-P	4	4	3 5/8 x 4	24.8	1500	..	B-HM	E-H	....	....	38	20	33	735
206B-4	B	S-P	4	4	3 5/8 x 5	32	1500	..	B-HM	E-H	....	....	38	20	33	760
283-4	D	S-P	4	4	4 1/4 x 5	44.8	1300	B	B-HM	E-H	....	....	46	26	42	1165
403-4	B	S-P	4	4	4 5/8 x 6	56.6	1200	..	B-HM	E-H	....	....	46	26	48	1250
425-6	D	S-P	4	6	4 1/4 x 5	66.4	1400	B	B-HM	E-H	....	....	60	27	46	1700
605-6	B	S	4	6	4 5/8 x 6	79.2	1200	..	B-HM	E-H	....	....	60	27	49	1900
1210-12*	B	S	4	12	4 5/8 x 6	160	1200	..	B-HM	E	....	....	112	49	72	5800

** Dual 6-cyl. engine. Note: Type "B" engine includes gasoline, natural gas, LPG and tractor fuel.*

Murphy Diesel Company
5317 West Burnham Street, Milwaukee, Wisconsin

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
11	A	M-P	4	4	5 3/4 x 6 1/2	90–110	1200–1400	O	....	E	....	T	70	43	66	3800
12	A	M-P	4	4	6 x 6 1/2	110–120	1200–1400	O	....	E	....	T	70	43	66	3800
111	A	M-P	4	4	5 3/4 x 6 1/2	115–125	1200–1400	O	....	E	*	T	70	43	66	3900
112	A	M-P	4	4	6 x 6 1/2	125–135	1200–1400	O	....	E	*	T	70	43	66	3900
20	C	M-P	4	6	5 1/2 x 6 1/2	135–145	1200–1400	O	....	E	....	S-T	93	43	66	4700
120	A	M-P	4	6	5 1/2 x 6 1/2	145–157	1200–1400	O	....	E	*	S-T	93	43	66	4800
21	C	M-P	4	6	5 3/4 x 6 1/2	150–162	1200–1400	O	....	E	....	S-T	93	43	66	4700
22	C	M-P	4	6	6 x 6 1/2	165–178	1200–1400	O	....	E	....	T	93	43	66	4700
121	A	M-P	4	6	5 3/4 x 6 1/2	170–184	1200–1400	O	....	E	*	T	93	43	66	4800
122	A	M-P	4	6	6 x 6 1/2	190–205	1200–1400	O	....	E	*	T	93	43	66	4800
24	A	M-P	4	6	6 1/8 x 6 1/2	185–200	1200–1400	O	....	E	....	T	93	43	66	4700
324	A	M-P	4	6	6 3/8 x 6 1/2	210–225	1200–1400	O	....	E	*	T	93	43	66	4800

** Tubo-supercharging manifold. All engines have open-type combustion chambers and unit injectors. Marine engines carry different model numbers, weights and dimensions.*

The National Supply Co., Engine Division
Springfield 99, Ohio
Superior Engines

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
6G-510	B	S-P	4	6	8 1/2 x 9	190–325	600–1000	..	HM	A-E-G	....	....	...	...	...	10000
40-6	C	M-S-P	4	6	8 1/2 x 10 1/2	215–325	600–900	D-B	....	A	....	....	...	...	...	14000
40-8	C	M-S-P	4	8	8 1/2 x 10 1/2	290–435	600–900	D-B	....	A	....	....	...	...	...	17000
40X-6	C	M-S-P	4	6	8 1/2 x 10 1/2	325–490	600–900	D-B	....	A	T	....	...	...	...	15500
40X-8	C	M-S-P	4	8	8 1/2 x 10 1/2	435–700	600–900	D-B	....	A	T	....	...	...	...	18500
44-G	B	S-P	4	6	9 x 10 1/2	245–365	600–900	..	HM	A	....	....	...	...	...	14000
6G-825	B	S-P	4	6	10 x 10 1/2	300–450	600–900	..	HM	A	....	....	...	...	...	14500
8G-825	B	S-P	4	8	10 x 10 1/2	400–600	600–900	..	HM	A	....	....	...	...	...	18500
60-6	C	M-S	4	6	12 x 15	410–530	400–514	B	....	A	....	....	...	...	...	39500
60-8	C	M-S	4	8	12 x 15	550–615	400–450	B	....	A	....	....	...	...	...	49000
60X-6	C	M-S	4	6	12 x 15	615–795	400–514	S	....	A	T	....	...	...	...	41500
60X-8	C	M-S	4	8	12 x 15	825–925	400–450	S	....	A	T	....	...	...	...	51000
65-6	C	M-S	4	6	12 3/4 x 15	580–700	500–600	S	....	A	....	....	...	...	...	44000
65-8	C	M-S	4	8	12 3/4 x 15	775–930	500–600	S	....	A	....	....	...	...	...	52000
65X-6	C	M-S	4	6	12 3/4 x 15	940–1325	500–600	S	....	A	T	....	...	...	...	46000
65X-8	C	M-S	4	8	12 3/4 x 15	1255–1765	500–600	S	....	A	T	....	...	...	...	55000
80-6	D	M-S	4	6	14 1/4 x 20	600–720	275–360	S	P	A	....	....	...	...	...	68000
80-8	D	M-S	4	8	14 1/4 x 20	800–960	275–360	S	P	A	....	....	...	...	...	85000
80X-6	D	M-S	4	6	14 1/4 x 20	900–1080	275–360	S	P	A	T	....	...	...	...	71500
80X-8	D	M-S	4	8	14 1/4 x 20	1200–1440	275–360	S	P	A	T	....	...	...	...	90000

Atlas Engines

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
35-4	A	M-S-P	4	4	6 1/2 x 8 1/4	95–110	900–1000	B	....	A-E	....	S-T	...	...	...	6000
35-6	A	M-S-P	4	6	6 1/2 x 8 1/4	145–195	900–1225	B	....	A-E	....	S-T	...	...	...	8000
35X-6	A	M-S-P	4	6	6 1/2 x 8 1/4	225–300	900–1225	B	....	A-E	T	S-T	...	...	...	8500
45-4	A	M-S-P	4	4	9 x 10 1/2	160–190	600–750	B-S	....	A	....	C-W	...	...	...	13500
45-5	A	M-S-P	4	5	9 x 10 1/2	200–240	600–750	B-S	....	A	....	C-W	...	...	...	14800
45-6	C	M-S-P	4	6	9 x 10 1/2	240–300	600–750	B-S	....	A	....	C-W	...	...	...	17400
45-8	C	M-S-P	4	8	9 x 10 1/2	320–400	600–750	B-S	....	A	....	C-W	...	...	...	21600
45X-6	C	M-S-P	4	6	9 x 10 1/2	360–450	600–750	B-S	....	A	T	C-W	...	...	...	18400
45X-8	C	M-S-P	4	8	9 x 10 1/2	480–600	360–750	B-S	....	A	T	C-W	...	...	...	22700
38	A	M-S	4	4	8 x 10 1/2	85	450	*	....	A	....	....	...	...	...	11500
48	A	M-S	4	4	9 x 10 1/2	110	325	*	....	A	....	....	...	...	...	15000
55	A	M-S	4	6	10 1/2 x 13	250	350	*	....	A	....	....	...	...	...	28000
58	A	M-S	4	6	11 1/2 x 15	350	360	*	....	A	....	....	...	...	...	43000
75-6	A	M-S	4	6	13 x 16	425	333	*	....	A	....	....	...	...	...	48000
75X-6	A	M-S	4	6	13 x 16	600	333	*	....	A	T	....	...	...	...	51000
76-6	A	M-S	4	6	13 x 16	500	360–400	B	....	A	....	....	...	...	...	50000
76X-6	A	M-S	4	6	13 x 16	750	360–400	B	....	A	T	....	...	...	...	53000
85-6	A	M-S	4	6	15 x 19	650	325	*	....	A	....	....	...	...	...	80000
85X-6	A	M-S	4	6	15 x 19	1000	325	*	....	A	T	....	...	...	...	88000

* Common Rail.

Lister Engines

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
3 1/2-1	A	S-P	4	1	3 3/4 x 5 1/2	3 1/2	650	B	....	H	....	....	36	24	40	750
6-1	A	S-P	4	1	4 1/2 x 5 1/2	6	650	B	....	H	....	....	38	24	40	760
12-2	A	S-P	4	2	4 1/2 x 5 1/2	12	650	B	....	H	....	....	50	24	40	1130
21-2	A	M-S	4	2	4 1/2 x 5 1/2	21	1200	B	....	H-E-A	....	....	48	25	41	1625
30-3	A	M-S	4	3	4 1/2 x 5 1/2	30	1200	B	....	H-E-A	....	....	58	25	41	2040
40-4	A	M-S	4	4	4 1/2 x 5 1/2	40	1200	B	....	H-E-A	....	....	67	25	41	2275
61-6	A	M-S	4	6	4 1/2 x 5 1/2	63	1200	B	....	A-E	....	....	75	32	44	3000
FR1	A	M-S-P	4	1	8 3/4 x 4 1/2	9	1800	B	....	H-E	....	S	27	23	36	750

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
FR2	A	M-S-P	4	2	3¾ x 4½	18	1800	B	....	H-E	....	S	32	23	36	970
FR3	A	M-S-P	4	3	3¾ x 4½	27	1800	B	....	H-E	....	S	37	23	36	1100
FR4	A	M-S-P	4	4	3¾ x 4½	36	1800	B	....	H-E	....	S	44	23	36	1270
FR6	A	M-S-P	4	6	3¾ x 4½	54	1800	B	....	H-E	....	S	54	23	36	1590

Nordberg Manufacturing Company
Milwaukee, Wisconsin

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
4FS-1	A	S	4	1	4½ x 5¼	10-15	1200-1800	B	....	E-H	....	....	...	...	...	.....
4FS-2	A	S	4	2	4½ x 5¼	20-30	1200-1800	B	....	E-H	....	....	...	...	...	.....
4FS-3	A	S	4	3	4½ x 5¼	30-45	1200-1800	B	....	E-H	....	....	...	...	...	.....
FS-95	D	M-S	4	5	9 x 11½	220-265	600-720	S	LM	A	....	D	...	...	...	.....
FS-96	D	M-S	4	6	9 x 11½	265-440	600-1000	S	LM	A	....	D	...	...	...	.....
FS-97	D	M-S	4	7	9 x 11½	310-370	600-720	S	LM	A	....	D	...	...	...	.....
FS-98	D	M-S	4	8	9 x 11½	355-590	600-1000	S	LM	A	....	D	...	...	...	.....
FS-95-SC	D	M-S	4	5	9 x 11½	330-400	600-720	S	LM	A	T	D	...	...	...	.....
FS-96-SC	D	M-S	4	6	9 x 11½	400-665	600-1000	S	LM	A	T	D	...	...	...	.....
FS-97-SC	D	M-S	4	7	9 x 11½	465-555	600-720	S	LM	A	T	D	...	...	...	.....
FS-98-SC	D	M-S	4	8	9 x 11½	530-885	600-1000	S	LM	A	T	D	...	...	...	.....
FS-96-HSC*	D	M-S	4	6	9 x 11½	535-1050	600-1000	S	LM	A	T	D	...	...	...	.....
FS-97-HSC*	D	M-S	4	7	9 x 11½	620-885	600-720	S	LM	A	T	D	...	...	...	.....
FS-98-HSC*	D	M-S	4	8	9 x 11½	710-1400	600-1000	S	LM	A	T	D	...	...	...	.....
FS-135	C	M-S	4	5	13 x 16½	500-570	450-514	S	LM	A	....	D	...	...	...	.....
FS-136	D	M-S	4	6	13 x 16½	600-800	450-600	S	LM	A	....	D	...	...	...	.....
FS-137	D	M-S	4	7	13 x 16½	700-800	450-514	S	LM	A	....	D	...	...	...	.....
FS-138	D	M-S	4	8	13 x 16½	800-1065	450-600	S	LM	A	....	D	...	...	...	.....
FS-135-SC	D	M-S	4	5	13 x 16½	750-850	450-514	S	LM	A	T	D	...	...	...	.....
FS-136-SC	D	M-S	4	6	13 x 16½	900-1200	450-600	S	LM	A	T	D	...	...	...	.....
FS-137-SC	D	M-S	4	7	13 x 16½	1050-1200	450-514	S	LM	A	T	D	...	...	...	.....
FS-138-SC	D	M-S	4	8	13 x 16½	1200-1600	450-600	S	LM	A	T	D	...	...	...	.....
FS-136-HSC*	D	M-S	4	6	13 x 16½	1200-1900	450-600	S	LM	A	T	D	...	...	...	.....
FS-137-HSC*	D	M-S	4	7	13 x 16½	1400-1900	450-514	S	LM	A	T	D	...	...	...	.....
FS-138-HSC*	D	M-S	4	8	13 x 16½	1600-2500	450-600	S	LM	A	T	D	...	...	...	.....
FS-1312-HSC*	D	M-S	4	12	13 x 16½	2400-3800	450-600	S	LM	A	T	D	...	...	...	.....
FS-1316-HSC*	D	M-S	4	16	13 x 16½	3200-5000	450-600	S	LM	A	T	D	...	...	...	.....
FS-135	C	M-S	4	5	13 x 20	480-535	360-400	S	P	A	....	D	...	...	...	.....
FS-136	D	M-S	4	6	13 x 20	580-725	360-450	S	P	A	....	D	...	...	...	.....
FS-137	D	M-S	4	7	13 x 20	680-755	360-400	S	P	A	....	D	...	...	...	.....
FS-138	D	M-S	4	8	13 x 20	775-970	360-450	S	P	A	....	D	...	...	...	.....
FS-135-SC	D	M-S	4	5	13 x 20	725-805	360-400	S	P	A	T	D	...	...	...	.....
FS-136-SC	D	M-S	4	6	13 x 20	870-1090	360-450	S	P	A	T	D	...	...	...	.....
FS-137-SC	D	M-S	4	7	13 x 20	1020-1130	360-400	S	P	A	T	D	...	...	...	.....
FS-138-SC	D	M-S	4	8	13 x 20	1165-1450	360-450	S	P	A	T	D	...	...	...	.....
FS-136-HSC*	D	M-S	4	6	13 x 20	1160-1455	360-450	S	P	A	T	D	...	...	...	.....
FS-137-HSC*	D	M-S	4	7	13 x 20	1360-1510	360-400	S	P	A	T	D	...	...	...	.....
FS-138-HSC*	D	M-S	4	8	13 x 20	1555-1940	360-450	S	P	A	T	D	...	...	...	.....
FS-165	C	M-S	4	5	16 x 22	730	327	S	P	A	....	D	...	...	...	.....
FS-166	C	M-S	4	6	16 x 22	875	327	S	P	A	....	D	...	...	...	.....
FS-167	C	M-S	4	7	16 x 22	1020	327	S	P	A	....	D	...	...	...	.....
FS-168	C	M-S	4	8	16 x 22	1165	327	S	P	A	....	D	...	...	...	.....
FS-165-SC	C	M-S	4	5	16 x 22	1090	327	S	P	A	T	D	...	...	...	.....
FS-166-SC	C	M-S	4	6	16 x 22	1310	327	S	P	A	T	D	...	...	...	.....
FS-167-SC	C	M-S	4	7	16 x 22	1530	327	S	P	A	T	D	...	...	...	.....
FS-168-SC	C	M-S	4	8	16 x 22	1750	327	S	P	A	T	D	...	...	...	.....
FS-166-HSC*	C	M-S	4	6	16 x 22	1750	327	S	P	A	T	D	...	...	...	.....
FS-167-HSC*	C	M-S	4	7	16 x 22	2040	327	S	P	A	T	D	...	...	...	.....
FS-168-HSC*	C	M-S	4	8	16 x 22	2340	327	S	P	A	T	D	...	...	...	.....
RTS**-1412	D	S	2	12	14 x 16	2125	400	B	P	A	....	....	...	...	...	.....
TS-215	C	M-S	2	5	21½ x 31	2550	240	B	....	A	....	D	...	...	...	.....
TS-216	C	M-S	2	6	21½ x 31	3050	240	B	....	A	....	D	...	...	...	.....
TS-217	C	M-S	2	7	21½ x 31	3575	240	B	....	A	....	D	...	...	...	.....
TS-218	C	M-S	2	8	21½ x 31	4075	240	B	....	A	....	D	...	...	...	.....
TS-219	C	M-S	2	9	21½ x 31	4600	240	B	....	A	....	D	...	...	...	.....
TS-2110	C	M-S	2	10	21½ x 31	5100	240	B	....	A	....	D	...	...	...	.....
TS-2112	C	M-S	2	12	21½ x 31	6150	240	B	....	A	....	D	...	...	...	.....
TS-295	C	M-S	2	5	29 x 40	4500	180	B	....	A	....	D	...	...	...	.....
TS-296	C	M-S	2	6	29 x 40	5400	180	B	....	A	....	D	...	...	...	.....
TS-297	C	M-S	2	7	29 x 40	6300	180	B	....	A	....	D	...	...	...	.....
TS-298	C	M-S	2	8	29 x 40	7200	180	B	....	A	....	D	...	...	...	.....
TS-299	C	M-S	2	9	29 x 40	8100	180	B	....	A	....	D	...	...	...	.....
TS-2910	C	M-S	2	10	29 x 40	9000	180	B	....	A	....	D	...	...	...	.....
TS-2912	C	M-S	2	12	29 x 40	10800	180	B	....	A	....	D	...	...	...	.....

* Supairthermal execution. ** Radial engine. Engines are designed to operate continuously at ratings shown and are good for 10 per cent overload for 2 hr in any 24 hr period.

The Palmer Engine Company
Cos Cobb, Connecticut

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
RND-1	A	S	4	1	4¼ x 6	9	1000	B	....	H	....	....	32	25	41	900
PM-672	A	M	4	6	4⅞ x 6	125-140	1600-1800	B	....	E	....	T	80	26	30	3400

RND model has Russell-Newbury turbulence chamber. Height is given above shaft centerline.

Rathbun-Jones Engineering Company
Toledo, Ohio

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
18	C	S	4	3	11 x 18	220	450	O	....	A	....	....	158	70	106	26000
18	C	S	4	4	11 x 18	290	450	O	....	A	....	....	177	70	106	31500
18	C	S	4	5	11 x 18	364	450	O	....	A	....	....	196	70	106	36300
18	C	M-S	4	6	11 x 18	435	450	O	....	A	....	D	215	70	106	41200
18	C	M-S	4	7	11 x 18	510	450	O	....	A	....	D	238	70	106	46000
18	C	M-S	4	8	11 x 18	580	450	O	....	A	....	D	258	70	106	51000
22	C	S	4	3	15½ x 22	388	327	O	....	A	....	....	175	80	126	41500
22	C	S	4	4	15½ x 22	518	327	O	....	A	....	....	197	80	126	50000
22	C	S	4	5	15½ x 22	650	327	O	....	A	....	....	225	80	126	58500
22	C	M-S	4	6	15½ x 22	775	327	O	....	A	....	D	247	80	126	68000
22	C	M-S	4	7	15½ x 22	910	327	O	....	A	....	D	271	80	126	75500
22	C	M-S	4	8	15½ x 22	1035	327	O	....	A	....	D	298	80	126	85000
24	C	S	4	3	18¼ x 24	540	300	O	....	A	....	....	200	85	140	60000
24	C	S	4	4	18¼ x 24	720	300	O	....	A	....	....	231	85	140	74000
24	C	S	4	5	18¼ x 24	900	300	O	....	A	....	....	258	85	140	87000

(Specifications continued on next page)

Rathbun-Jones *(Continued from preceding page)*

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
24	C	M-S	4	6	18¼ x 24	1080	300	O	....	A	....	D	294	85	140	98000
24	C	M-S	4	7	18¼ x 24	1260	300	O	....	A	....	D	321	85	140	110000
24	C	M-S	4	8	18¼ x 24	1440	300	O	....	A	....	D	348	85	140	120000
28	C	S	4	5	19⅓ x 28	1025	257	O	....	A	....	....	332	104	171	140000
28	C	M-S	4	6	19⅓ x 28	1230	257	O	....	A	....	D	339	104	171	164000
28	C	M-S	4	7	19⅓ x 28	1435	257	O	....	A	....	D	380	104	171	187000
28	C	M-S	4	8	19⅓ x 28	1640	257	O	....	A	....	D	409	104	171	212000
28	C	S	4	10	19⅓ x 28	2050	257	O	....	A	....	....	460	104	171	230000
28	C	S	4	12	19⅓ x 28	2460	257	O	....	A	....	....	528	104	171	260000

Engines have Price turbulence chamber combustion system and Rathbun distributor type fuel injection system. Lengths listed are approximate for stationary engines and include generator, exciter drive and outboard bearing. Widths include operating platforms. Marine lengths, including thrust bearing, are considerably shorter. Weights are for stationary units.

R. H. Sheppard Company, Inc.
Hanover, Pennsylvania

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
9	A	S	4	1	3⅛ x 4	4	1800	O	....	E	....	....	29	23	36	575
7	A	S	4	1	4 x 5	10	1800	O	....	E	....	....	37	31	46	1090
7D	A	S	4	1	4¼ x 5	11	1800	O	....	E	....	....	37	31	46	1090
17	A	M-S	4	2	3⅛ x 4	13.5	1800	O	....	E	....	†	33	22	31	550
13	A	M-S-P	4	2	4 x 5	20	1800	O	....	E	....	†	43	24	49	1365
13D	A	M-S-P	4	2	4¼ x 5	22	1800	O	....	E	....	†	43	24	49	1365
6A-1	A	M-S-P	4	3	4 x 5	30	1800	O	....	E	....	†	55	26	51	1662
6D	A	M-S-P	4	3	4¼ x 5	34	1800	O	....	E	....	†	55	26	51	1662
16	A	M-S-P	4	4	4⅛ x 5	51.4	1800	O	....	E	....	†	65	22	46	1725
12	A	M-S-P	4	6	4 x 5	61	1800	O	....	E	....	†	70	24	52	2100
12D	A	M-S-P	4	6	4¼ x 5	67	1800	O	....	E	....	†	70	24	52	2100

† Reverse gear optional. Weights & dimensions are for "S" & "P" units.

Sterling Engine Company
Buffalo, New York

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
AB-6	A	M-S	4	6	4½ x 5¾	72–110	1400–1800	B	....	E	....	S	58	30	53	3150
DB-6	A	M-S	4	6	5½ x 7	114–170	1200–1500	B	....	E	....	S	60	36	60	5200
DB-8	A	M-S	4	8	5½ x 7	152–230	1200–1500	B	....	E	....	S	75	36	60	6850
VD-6	A	M-S	4	6	8 x 9	325–470	1200–1500	B-S	....	A-E	....	S-T	95	40	64	8500
VD-6-S	A	M-S	4	6	8 x 9	750–940	1200–1500	B	....	A-E	T	S	115	40	64	9160
VD-8-S	A	S	4	8	8 x 9	1000–1250	1200–1500	B	....	A-E	T	....	136	40	64	12450
LC-6	B	S	4	6	5¼ x 6	72–210	800–2000	..	B	E	....	....	57	33	42	2200
TC-6	B	S	4	6	8 x 9	260–560	700–1500	..	B	A-E	....	....	101	45	64	6900
TC-8	B	S	4	8	8 x 9	365–750	700–1500	..	B	A-E	....	....	122	45	64	9000

Weights and dimensions are given for "S" units. Horsepower listings indicate continuous and intermittent ratings.

Sun Shipbuilding and Dry Dock Co.
Chester, Pennsylvania

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
510-LB-3	..	M	2	3	20⅛ x 44⅜ +33⅛	1500	90	O	....	A	....	D	444	132	336	322000
540-L-4	..	M	2	4	21¼ x 42½ +42½	2500	90	O	....	A	....	D	576	132	362*	470000
580-L-4	..	M	2	4	22⅛ x 45⅝ +45⅝	2800	80	O	....	A	....	D	612	134	389	580000
600-L-4	..	M	2	4	23⅝ x 45⅝ +45⅝	3000	80	O	....	A	....	D	624	134	389	625000
600-LB-4	..	M	2	4	23⅝ x 45⅝ +33⅛	2700	100	O	....	A	....	D	624	134	385*	600000
640-LB-6	..	M	2	6	25⅛ x 45⅝ +33⅛	5600	100	O	....	A	....	D	816	134	427*	930000
26-LB-4	..	M	2	4	26 x 46 +33	3600	115	O	....	A	....	D	624	134	401*	655000
31-LB-4	..	M	2	4	31 x 50 +36	4800	90	O	....	A	....	D	729	152	433*	1015000
31-LB-5	..	M	2	5	31 x 50 +36	7200	100	O	....	A	....	D	808	152	407	1166000
32-LB-4	..	M	2	4	32 x 55 +40	6000	94	O	....	A	....	D	736	152	427	1052000
32-LB-5	..	M	2	5	32 x 55 +40	7500	94	O	....	A	....	D	862	152	490*	1342000
21-LB-6†	..	M	2	6	21 x 35 +25	4500	180	O	....	A	....	D	602	127	292	450000
.....	..	S	2	4	21 x 35 +25	3000	200	..	....	.....	....	....	540	127	315*	366000
.....	..	S	2	5	21 x 35 +25	3800	200	..	....	.....	....	....	629	127	325*	458000
.....	..	S	2	6	21 x 35 +25	4500	200	..	....	.....	....	....	718	127	333*	550000
.....	..	S	2	4	26 x 46 +33	4500	150	..	....	.....	....	....	624	134	401*	655000
.....	..	S	2	5	26 x 46 +33	6000	150	..	....	.....	....	....	757	134	399*	820000
.....	..	S	2	6	26 x 46 +33	7500	150	..	....	.....	....	....	863	134	411*	985000
.....	..	S	2	4	32 x 55 +40	9000	138	..	....	.....	....	....	736	152	468*	1145000
.....	..	S	2	5	32 x 55 +40	11200	138	..	....	.....	....	....	862	152	490*	1342000
.....	..	S	2	6	32 x 55 +40	13500	138	..	....	.....	....	....	1092	152	444*	1700000

*Engines are of the opposed-piston type. † Drives through reduction gear (Ratio 2.092 to 1) Maximum heights shown. * Height to top of scavenging air pump. Other figures show cylinder height.*

Union Diesel Engine Co.,
Oakland, Calif.

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
GA6	D	M-S	4	6	8¼ x 11	175-225	475-600	O	LM	A	....	D	144	34	68	14000
GA6S	D	M-S	4	6	8½ x 11	260-330	475-600	O	LM	A	T	D	146	34	68	15000
L6	D	M-S	4	6	10 x 14	230-340	350-514	O	LM	A	....	D	175	42	85	23500
L6S	D	M-S	4	6	10 x 14	340-500	350-514	O	LM	A	T	D	178	42	85	24500
P6	D	M-S	4	6	12 x 15	410-525	400-514	O	LM	A	....	D	194	46	93	36500
P6S	D	M-S	4	6	12 x 15	600-700	400-514	O	LM	A	T	D	194	46	93	38000
V6	D	M-S	4	6	14 x 19	560-700	325-400	O	LM	A	....	D	242	57	114	58000
V6S	D	M-S	4	6	14 x 19	740-1000	325-400	O	LM	A	T	D	242	57	114	60000
Z6	D	M-S	4	6	16 x 20½	600-750	240-300	O	LM	A	....	D	275	62	125	87500
Z6S	D	M-S	4	6	16 x 20½	900-1125	240-300	O	LM	A	T	D	285	62	125	90000
GA8	D	M-S	4	8	8½ x 11	235-300	450-600	O	LM	A	....	D	178	34	68	18000
GA8S	D	M-S	4	8	8½ x 11	345-440	450-600	O	LM	A	T	D	180	34	68	19000
L8	D	M-S	4	8	10 x 14	300-450	350-514	O	LM	A	....	D	214	42	85	32000
L8S	D	M-S	4	8	10 x 14	420-660	350-514	O	LM	A	T	D	217	42	85	33500
P8	D	M-S	4	8	12 x 15	550-700	400-514	O	LM	A	....	D	235	46	93	46000
P8S	D	M-S	4	8	12 x 15	800-1000	400-514	O	LM	A	T	D	239	46	93	48000
V8	D	M-S	4	8	14 x 19	750-925	325-400	O	LM	A	....	D	292	57	114	74000
V8S	D	M-S	4	8	14 x 19	1125-1400	325-400	O	LM	A	T	D	296	57	114	76000
Z8	D	M-S	4	8	16 x 20½	800-1000	240-300	O	LM	A	....	D	347	62	125	112000
Z8S	D	M-S	4	8	16 x 20½	1200-1500	240-300	O	LM	A	T	D	350	62	125	115000

Washington Iron Works
1500 Sixth Avenue, South
Seattle, Washington

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
3-125	A	M-S	4	3	9 x 12½	90	400	S	....	A	....	O	128	38	83	13500
4-125	A	M-S	4	4	9 x 12½	120	400	S	....	A	....	O	142	38	83	14700
5-125	A	M-S	4	5	9 x 12½	150	400	S	....	A	....	D	137	38	83	16500
6-125	A	M-S	4	6	9 x 12½	200	450	S	....	A	....	D	151	38	83	18000
6-125TS	A	M-S	4	6	9 x 12½	285	450	S	....	A	T	D	151	38	83	19000
8-125	A	M-S	4	8	9 x 12½	270	450	S	....	A	....	D	181	38	83	21000
8-125TS	A	M-S	4	8	9 x 12½	380	450	S	....	A	T	D	181	38	83	22000
3-13	A	M-S	4	3	10¼ x 13½	120	360	S	....	A	....	O	136	40	89	15800
4-13	A	M-S	4	4	10¼ x 13½	160	360	S	....	A	....	O	158	40	89	18500
6-13	A	M-S	4	6	10¼ x 13½	260	390	S	....	A	....	D	166	40	89	23000
6-13TS	A	M-S	4	6	10¼ x 13½	345	390	S	....	A	T	D	166	40	89	24000
8-13	A	M-S	4	8	10¼ x 13½	350	390	S	....	A	....	D	202	40	89	26500
8-13TS	A	M-S	4	8	10¼ x 13½	460	390	S	....	A	T	D	202	40	89	27500
4-15	A	M-S	4	4	11½ x 15	200	327	S	....	A	....	D	169	46	100	27000
6-15	A	M-S	4	6	11½ x 15	330	360	S	....	A	....	D	189	46	100	31500
6-15TS	A	M-S	4	6	11½ x 15	450	360	S	....	A	T	D	189	46	100	33000
8-15	A	M-S	4	8	11½ x 15	440	360	S	....	A	....	D	233	46	100	40500
8-15TS	A	M-S	4	8	11½ x 15	600	360	S	....	A	T	D	233	46	100	43000
6-160	A	M-S	4	6	12¾ x 16	400	360	S	....	A	....	D	209	50	107	42000
6-160TS	A	M-S	4	6	12¾ x 16	585	360	S	....	A	T	D	209	50	107	44000
8-160	A	M-S	4	8	12¾ x 16	550	360	S	....	A	....	D	249	50	107	53000
8-160TS	A	M-S	4	8	12¾ x 16	780	360	S	....	A	T	D	294	50	107	55000
6-18	A	M-S	4	6	14½ x 18	500	300	S	....	A	....	D	245	56	121	62500
6-18TS	A	M-S	4	6	14½ x 18	710	300	S	....	A	T	D	245	56	121	65000
8-18	A	M-S	4	8	14½ x 18	665	300	S	....	A	....	D	292	56	121	80000
8-18TS	A	M-S	4	8	14½ x 18	945	300	S	....	A	T	D	292	56	121	82500
6-20	A	M-S	4	6	16 x 20	640	277	S	....	A	....	D	264	61	133	82000
6-20TS	A	M-S	4	6	16 x 20	885	277	S	....	A	T	D	264	61	133	85000
8-20	A	M-S	4	8	16 x 20	850	277	S	....	A	....	D	321	61	133	103000
8-20TS	A	M-S	4	8	16 x 20	1180	277	S	....	A	T	D	321	61	133	106000

Engines have open combustion chamber. All are for both marine and stationary use. Lengths and weights are for marine engines. All marine models are direct reversing except 3 and 4-cyl. units which have reverse gear.

Waukesha Motor Company
Waukesha, Wisconsin

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
ICK	B	S-P	4	4	2½ x 3⅛	12*	2000	..	B-HM	H-E	....	....	22	13	21	195
FC	B	S-P	4	4	3¼ x 4	26*	1800	..	B-HM	H-E	....	....	28	19	21	290
180GLC	B	S-P	4	4	3½ x 3¾	32*	2000	..	B-HM	H-E	....	....	31	19	28	450
180DLC	A	S-P	4	4	3½ x 3¾	31*	2000	B	....	H-E	....	....	31	19	28	475
XAH	B	S-P	4	4	3⅝ x 4½	35*	1800	..	B-HM	H-E	....	....	33	19	27	385
185GLC	B	S-P	4	6	3½ x 3¾	48*	2000	..	B-HM	H-E	....	....	31	22	30	675
185DLC	A	S-P	4	6	3½ x 3¾	44*	2000	B	....	H-E	....	....	31	22	30	675
190GLB	B	S-P	4	6	3¾ x 4	58*	2000	..	B-HM	H-E	....	....	43	22	30	690
190DLCA	A	S-P	4	6	3¾ x 4	58†*	2000	B	....	H-E	....	....	43	22	29	868
195GL	B	S-P	4	6	4 x 4	65*	2000	..	B-HM	H-E	....	....	43	22	30	775
195DLCA	A	S-P	4	6	4 x 4	67†*	2000	B	....	E	....	....	43	26	30	965
195GK	B	S-P	4	6	4½ x 4	71*	2000	..	B-HM	H-E	....	....	44	22	30	780
MZA	B	S-P	4	6	4¼ x 4¾	64*	1600	..	B-HM	H-E	....	....	44	21	34	920
135GK	B	S-P	4	6	4¼ x 5	86*	1800	..	B-HM	E	....	....	47	26	38	1325
135DKB	A	S-P	4	6	4¼ x 5	99†*	2000	B	....	E	....	....	48	26	35	1386
135DKBS	A	S-P	4	6	4¼ x 5	121†*	2000	B	....	E	T	....	48	26	41	1486
135GZ	B	S-P	4	6	4¼ x 5	92*	1800	..	B-HM	E	....	....	48	26	38	1325
140GKB	B	S-P	4	6	4½ x 5¼	122†*	1800	..	B-HM	E	....	....	52	26	43	1390
145GKB	B	S-P	4	6	5¼ x 6	157†*	1800	..	B-HM	E-G	....	....	56	29	47	1810
148DKB	A	S-P	4	6	5¼ x 6	147†*	1800	B	....	E-G	....	....	56	29	47	2320
148DKBS	A	S-P	4	6	5¼ x 6	194†*	1800	B	....	E-G	T	....	56	29	56	2445
145GZB	B	S-P	4	6	5⅜ x 6	164†*	1800	..	B-HM	E-G	....	....	56	29	47	1820
WAKB	B	S-P	4	6	6¼ x 6½	227†*	1600	..	HM	E-G	....	....	67	33	51	3150
WAKR	B	S-P	4	6	6¼ x 6½	217*	1600	..	HM	E-G	....	....	67	33	51	3050
WAKDB	A	S-P	4	6	6¼ x 6½	195†*	1600	B	....	E-G	....	....	67	33	51	3800
WAKDBS	A	S-P	4	6	6¼ x 6½	259†*	1600	B	....	E-G	T	....	67	33	63	3925
NKR	B	S-P	4	6	7 x 8¼	260*	1200	..	HM	G	....	....	79	48	61	6900
NKDB	A	S-P	4	6	7 x 8¼	238†*	1200	B	....	G	....	....	79	48	61	9285
NKDBS	A	S-P	4	6	7 x 8¼	312†*	1200	B	....	G	T	....	79	48	61	9435
LRO	B	S-P	4	6	8½ x 8½	336*	1000	..	HM	G	....	....	98	49	70	9940
LRDB	A	S-P	4	6	8½ x 8½	332†*	1200	B	....	G	....	....	98	49	70	10300
LRDBS	A	S-P	4	6	8½ x 8½	456†*	1200	B	....	G	T	....	114	49	70	10450
LRZ	B	S-P	4	6	9⅜ x 8½	394*	1000	..	HM	G	....	....	....	....	....	.....

** Continuous hp ratings are based on 80 per cent of maximum at speeds indicated. Gas ratings on natural gas & LPG are approximately 10 per cent lower.*
† Either counterbalanced or standard crankshafts available—ratings shown are for counterbalanced shaft.

White-Roth Machine Corporation
Lorain, Ohio

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
L	B	S	2	1	7½ x 8	24	600	..	HM	H-G	....	....	72	50	48	2810
LD	A	S	2	1	7½ x 8	21	600	S	....	G	....	....	72	50	48	2810
O	B	S	2	1	9½ x 10	89	450	..	HM	H-G	....	....	88	60	51	4300
OD	A	S	2	1	9½ x 10	32	450	S	....	G	....	....	88	60	51	4300
R	B	S	2	1	12 x 13	58	325	..	HM	G	....	....	112	71	66	8000
A	B	S	2	1	13 x 13	67	325	..	HM	G	....	....	112	72	66	8300
AD	A	S	2	1	13 x 13	57	325	S	....	G	....	....	112	72	66	8500

Witte Engine Works
Oil Well Supply Division, U. S. Steel Corporation
Kansas City 26, Missouri

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
AD	A	S-P	4	1	3¼ x 4½	4-5.5	1200-1500	B-D	....	H-E	....	....	24	24	33	450
BD	A	S-P	4	1	4¼ x 6	8	900	B-D	....	H-E	....	....	46	34	28	930
LD	A	S-P	4	1	4¼ x 5¼	9	1350	B-D	....	H-E	....	....	29	28	44	842
CD	A	S-P	4	1	5 x 8	12.5	750	B	....	H-E	....	....	53	36	37	1352
B	B	S-P	4	1	5 x 6	10	900	..	HM	H	....	....	47	39	42	1285
C	B	S-P	4	1	6 x 8	15.5	750	..	HM	H	....	....	57	47	49	1760
98	B	S-P	4	1	5 x 5	10	1200	..	HM	H-E	....	....	39	36	36	655

Wolverine Motor Works, Inc.
Bridgeport, Conn.

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
WM426	A	M	4	6	4¼ x 5	100	1600	B	....	A-E	....	S	83	25	40	2300
WM426T	A	M	4	6	4¼ x 5	120	1600	B	....	A-E	T	S	83	25	40	2600
WM779	A	M	4	6	5⅛ x 6	150	1400	B	....	A-E	....	S	94	40	49	3100
WM779T	A	M	4	6	5⅛ x 6	180	1400	B	....	A-E	T	S	94	46	49	3400
WM1197	A	M	4	6	6⅛ x 6½	210	1400	B	....	A-E	....	S	110	40	54	5600
WM1197T	A	M	4	6	6⅛ x 6½	275	1400	B	....	A-E	T	S	110	47	54	5900
WM1905	A	M	4	6	7 x 8¼	280	1100	B	....	A-E	....	S	141	41	64	10000
WM1905T	A	M	4	6	7 x 8¼	360	1100	B	....	A-E	T	S	141	44	64	10400
WM2894	A	M	4	6	8½ x 8½	400	1100	B	....	A-E	....	S	171	46	84	12000
WM2894T	A	M	4	6	8½ x 8½	525	1100	B	....	A-E	T	S	171	60	84	12500
WM2980	A	M	4	5	8½ x 10½	200	650	S	....	A	....	S	133	37	61	12500
WM3570	A	M	4	6	8½ x 10½	240	650	S	....	A	....	S	147	37	61	14400
WM3570T	A	M	4	6	8½ x 10½	360	650	S	....	A	T	S	155	44	79	15200
WM4725	A	M	4	5	9¼ x 14	200	400	O	....	A	....	D	162	38	75	19200
WM5669	A	M	4	6	9¼ x 14	240	400	O	....	A	....	D	182	38	75	21000
WM7559	A	M	4	8	9¼ x 14	320	400	O	....	A	....	D	213	38	75	24750

Worthington Corporation
Harrison, New Jersey

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
W96	D	S-P	4	6	9 x 11	425	900	..	....	A	....	....	....	....	....	.....
W98	D	S-P	4	8	9 x 11	570	900	..	....	A	....	....	....	....	....	.....
SW96	D	S-P	4	6	9 x 11	955	900	..	....	A	T	....	....	....	....	.....
SW98	D	S-P	4	8	9 x 11	1275	900	..	....	A	T	....	....	....	....	.....
DH5	D	S-P	4	5	12 x 14	510	600	..	....	A	....	....	....	....	....	.....
DH6	D	S-P	4	6	12 x 14	610	600	..	....	A	....	....	....	....	....	.....
DH8	D	S-P	4	8	12 x 14	815	600	..	....	A	....	....	....	....	....	.....
SDH5	D	S-P	4	5	12 x 14	830	600	..	....	A	T	....	....	....	....	.....
SDH6	D	S-P	4	6	12 x 14	990	600	..	....	A	T	....	....	....	....	.....
SDH8	D	S-P	4	8	12 x 14	1325	600	..	....	A	T	....	....	....	....	.....
SCC5	D	S	4	5	10¾ x 14½	515	514	..	....	A	T	....	....	....	....	.....
SCC6	D	S	4	6	10¾ x 14½	615	514	..	....	A	T	....	....	....	....	.....
SCC7	D	S	4	7	10¾ x 14½	720	514	..	....	A	T	....	....	....	....	.....
SCC8	D	S	4	8	10¾ x 14½	825	514	..	....	A	T	....	....	....	....	.....
DR5	D	S	4	5	13¼ x 17½	580	450	..	....	A	....	....	....	....	....	.....
DR6	D	S	4	6	13¼ x 17½	700	450	..	....	A	....	....	....	....	....	.....
DR7	D	S	4	7	13¼ x 17½	815	450	..	....	A	....	....	....	....	....	.....
DR8	D	S	4	8	13¼ x 17½	930	450	..	....	A	....	....	....	....	....	.....
SDR5	D	S	4	5	13¼ x 17½	1020	450	..	....	A	T	....	....	....	....	.....
SDR6	D	S	4	6	13¼ x 17½	1230	450	..	....	A	T	....	....	....	....	.....
SDR7	D	S	4	7	13¼ x 17½	1435	450	..	....	A	T	....	....	....	....	.....
SDR8	D	S	4	8	13¼ x 17½	1635	450	..	....	A	T	....	....	....	....	.....
EH5	C	S	4	5	16 x 20	730	360	..	....	A	....	....	....	....	....	.....
EH6	C	S	4	6	16 x 20	880	360	..	....	A	....	....	....	....	....	.....
EH7	C	S	4	7	16 x 20	1025	360	..	....	A	....	....	....	....	....	.....
EH8	C	S	4	8	16 x 20	1170	360	..	....	A	....	....	....	....	....	.....
SEH5	D	S	4	5	16 x 20	1255	360	..	....	A	T	....	....	....	....	.....
SEH6	D	S	4	6	16 x 20	1515	360	..	....	A	T	....	....	....	....	.....
SEH7	D	S	4	7	16 x 20	1760	360	..	....	A	T	....	....	....	....	.....
SEH8	D	S	4	8	16 x 20	2010	360	..	....	A	T	....	....	....	....	.....
SW14-6	D	S	4	6	14 x 18	1875	450	..	....	A	T	....	....	....	....	.....
SW14-8	D	S	4	8	14 x 18	2500	450	..	....	A	T	....	....	....	....	.....
SW14-12	D	S	4	12	14 x 18	3750	450	..	....	A	T	....	....	....	....	.....
SW14-16	D	S	4	16	14 x 18	5000	450	..	....	A	T	....	....	....	....	.....
BBG5	B	S-P	4	5	9 x 10½	190	600	..	....	A	....	....	....	....	....	.....
BBG6	B	S-P	4	6	9 x 10½	230	600	..	....	A	....	....	....	....	....	.....
CCG5	B	S-P	4	5	12¼ x 14½	445	514	..	....	A	....	....	....	....	....	.....
CCG6	B	S-P	4	6	12¼ x 14½	530	514	..	....	A	....	....	....	....	....	.....
CCG7	B	S-P	4	7	12¼ x 14½	620	514	..	....	A	....	....	....	....	....	.....
CCG8	B	S-P	4	8	12¼ x 14½	710	514	..	....	A	....	....	....	....	....	.....
DDG5	B	S	4	5	15 x 17½	560	360	..	....	A	....	....	....	....	....	.....
DDG6	B	S	4	6	15 x 17½	675	360	..	....	A	....	....	....	....	....	.....
DDG7	B	S	4	7	15 x 17½	785	360	..	....	A	....	....	....	....	....	.....
DDG8	B	S	4	8	15 x 17½	900	360	..	....	A	....	....	....	....	....	.....
EHGL5	B	S	4	5	16¾ x 20	800	360	..	....	A	....	....	....	....	....	.....
EHGL6	B	S	4	6	16¾ x 20	960	360	..	....	A	....	....	....	....	....	.....
EHGL7	B	S	4	7	16¾ x 20	1120	360	..	....	A	....	....	....	....	....	.....
EHGL8	B	S	4	8	16¾ x 20	1280	360	..	....	A	....	....	....	....	....	.....
SEHGL5	B	S	4	5	16¾ x 20	1300	360	..	....	A	T	....	....	....	....	.....
SEHGL6	B	S	4	6	16¾ x 20	1565	360	..	....	A	T	....	....	....	....	.....
SEHGL7	B	S	4	7	16¾ x 20	1825	360	..	....	A	T	....	....	....	....	.....
SEHGL8	B	S	4	8	16¾ x 20	2085	360	..	....	A	T	....	....	....	....	.....

Imported Diesels

Petter Engine Division of Brush ABOE Inc.
60-07 39th Avenue, Woodside 77, New York

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
PAZ1	A	S-P	4	1	3 x 3	2½	1500	**	....	H	....	....	18	18	26	260
AVA1*	A	S-P	4	1	3.15 x 4.33	6	1800	**	....	E-H	....	....	30	21	30	390
AVA2*	A	S-P	4	2	3.15 x 4.33	12	1800	**	....	E-H	....	....	37	21	32	558
AV1	A	S-P	4	1	3.15 x 4.33	6	1800	**	....	E-H	....	....	30	21	29	406
AV2	A	M-S-P	4	2	3.15 x 4.33	10–12	1500–1800	**	....	E-H	....	†	37	21	32	598
B2	A	M-S-P	4	2	4.33 x 4.33	20	1500	**	....	E-H	....	†	46	23	41	907
B3	A	M-S-P	4	3	4.33 x 4.33	30	1500	**	....	E-H	....	†	56	23	41	1211
B4	A	M-S-P	4	4	4.33 x 4.33	40	1500	**	....	E-H	....	†	62	23	41	1491

** Air cooled.* *** Bryce.* *† Parsons.* *Dimensions are for "S"& "P" units.*

Bamfords———International Selling Corporation
122 E. 42nd Street, New York 17, N. Y.

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
Z1	A	M-S	4	1	4½ x 5	3½	600	*	....	H-E	....	....	38	26	41	950
Z2	A	M-S	4	1	4½ x 5	4¼-5½	600-700	*	....	H-E	....	....	38	26	41	965
Z3&4	A	M-S	4	1	5 x 6	7-8	600-700	*	....	H-E	....	....	42	39	28	1050
Z7&8	A	M-S	4	2	5 x 6	14-16	600-700	*	....	H-E	....	....	48	28	42	1470

** C.A.V.*

Burmeister & Wain American Corporation
17 Battery Place, New York 4, N.Y.

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
20MT-30	A	S	4	2-6	7.9 x 11.8	35*	600	O	....	A	....	....	....	....	....	.....
20MTB-30	A	S	4	3-6	7.9 x 11.8	50*	600	O	....	A	T	....	....	....	....	.....
25MT-40	A	S	4	2-7	9.8 x 15.7	60*	500	O	....	A	....	....	....	....	....	.....
25MTB-40	A	S	4	3-7	9.8 x 15.7	85*	500	O	....	A	T	....	....	....	....	.....
33MT-48	A	M-S	4	3-7	13.0 x 18.9	100*	400	O	....	A	....	D	....	....	....	.....
28V-50	A	M-S	2	4-9	11.0 x 19.7	122*	360	O	....	A	....	D	....	....	....	.....
33MTB-48	A	M-S	4	3-7	13.0 x 18.9	140*	400	O	....	A	T	D	....	....	....	.....
28VB-50	A	M-S	2	5-9	11.0 x 19.7	165*	360	O	....	A	T	D	....	....	....	.....
35V-62	A	M-S	2	4-10	13.8 x 24.4	200*	300	O	....	A	....	D	....	....	....	.....
42V-75	A	M-S	2	4-10	16.5 x 29.5	240*	240	O	....	A	....	D	....	....	....	.....
35VB-62	A	M-S	2	5-10	13.8 x 24.4	270*	300	O	....	A	T	D	....	....	....	.....
42VB-75	A	M-S	2	5-10	16.5 x 29.5	324*	240	O	....	A	T	D	....	....	....	.....
50V-90	A	M-S	2	4-10	19.7 x 35.4	410*	200	O	....	A	....	D	....	....	....	.....
50VT-110	A	M-S	2	4-10	19.7 x 43.3	420*	170	O	....	A	....	D	....	....	....	.....
50VB-90	A	M-S	2	5-10	19.7 x 35.4	554*	200	O	....	A	T	D	....	....	....	.....
50VTB-110	A	M-S	2	5-10	19.7 x 43.3	567*	170	O	....	A	T	D	....	....	....	.....
74T-150	A	M-S	4	6-10	29.1 x 59.0	575*	120	O	....	A	....	D	....	....	....	.....
50VT-110/40	A	M-S	2	4-10	19.7 x 43.3/15.7	585*	170	O	....	A	....	D	....	....	....	.....
62V-115	A	M-S	2	4-10	24.4 x 45.3	600*	150	O	....	A	....	D	....	....	....	.....
62VT-115	A	M-S	2	4-10	24.4 x 45.3	600*	150	O	....	A	....	D	....	....	....	.....
50VBT-110/40	A	M-S	2	5-10	19.7 x 43.3/15.7	790*	170	O	....	A	T	D	....	....	....	.....
62VB-115	A	M-S	2	5-10	24.4 x 45.3	810*	150	O	....	A	T	D	....	....	....	.....
62VTB-115	A	M-S	2	5-10	24.4 x 45.3	810*	150	O	....	A	T	D	....	....	....	.....
74VT-140	A	M-S	2	4-10	29.1 x 55.1	875*	125	O	....	A	....	D	....	....	....	.....
74VT-160	A	M-S	2	5-12	29.1 x 63.0	920*	115	O	....	A	....	D	....	....	....	.....
74VTB-140	A	M-S	2	5-12	29.1 x 55.1	1190*	125	O	....	A	T	D	....	....	....	.....
75VT-150/50	A	M-S	2	4-10	29.5 x 59.0/19.7	1230*	120	O	....	A	....	D	....	....	....	.....
74VTB-160	A	M-S	2	5-12	29.1 x 63.0	1250*	115	O	....	A	T	D	....	....	....	.....
75VT-170/60	A	M-S	2	4-10	29.5 x 66.9/23.6	1300*	110	O	....	A	....	D	....	....	....	.....
75VTB-150/50	A	M-S	2	4-10	29.5 x 59.0/19.7	1650*	120	O	....	A	T	D	....	....	....	.....
75VTB-170/60	A	M-S	2	4-10	29.5 x 66.9/23.6	1755*	110	O	....	A	T	D	....	....	....	.....
B&W-340†	A	M	2	2-4	7.9 x 13.4	45*	450	O	....	A	....	††	....	....	....	.....
B&W-400†	A	M	2	2-6	9.1 x 15.7	60*	375	O	....	A	....	††	....	....	....	.....
BUKH-EV80	A	M-S-P	4	1	3.1 x 4.3	6*	1800	B	....	E-H**	....	....	....	....	....	.....
BUKH-EV100	A	M-S-P	4	1-3	3.9 x 5.1	10*	1500	B	....	E-H**	....	††	....	....	....	.....

** Hp per cylinder. ** Also cartridge start. † Alpha engine. †† Controllable pitch propeller and sailing clutch of own manufacture. On models with dual stroke, shorter stroke is for exhaust piston.*

Crofton Industrial Diesel Engines
San Diego 1, California

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
4-1A	A	....	4	1	3½ x 3½	4	1500	B	....	H-E	....	....	28*	19	28	235
5-1W	A	M-S	4	1	3½ x 3½	5-7	1500	B	....	H-E	....	....	39	18	27	246
7-1W	A	M-S	4	1	3½ x 3½	7-9	1500	B	....	H-E	....	....	39	18	27	266
9-1W	A	M-S	4	1	3½ x 3½	9-11	1500	B	....	H-E	....	....	39	18	27	275

** Includes starting handle. Ricardo type precombustion system is used.*

Klockner-Humboldt-Duetz———Diesel Energy Corporation
143 Liberty Street New York 6, N. Y.

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Super-Charge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
F2M414	A	M-S-P	4	2	4 x 5½	22	1500	O	....	H-E	....	....	32	25	38	1014
F2M417	A	S-P	4	2	4¾ x 6¾	32	1350	O	....	H-E	....	....	35	28	43	1520
1L514	A*	M-S-P	4	1	4⅛ x 5½	12.5-15	1500-1650	O	....	H-E	....	....	22	24	40	728
2L514	A*	M-S-P	4	2	4⅛ x 5½	25-30	1500-1600	O	....	H-E	....	....	27	27	38	850
3L514	A*	M-S-P	4	3	4⅛ x 5½	37.5-45	1500-1600	O	....	H-E	....	....	30	26	38	945
4L514	A*	M-S-P	4	4	4⅛ x 5½	60-90	1800-2300	B**	....	E	....	....	44	29	41	1043
6L514	A*	M-S-P	4	6	4⅛ x 5½	90-130	1800-2250	B**	....	E	....	....	54	33	40	1373
6L614	A*	M-S-P	4	V-6	4⅛ x 5½	90-130	1800-2250	B**	....	E	....	....	44	47	35	1595
8L614	A*	M-S-P	4	V-8	4⅛ x 5½	120-175	1800-2250	B**	....	E	....	....	47	47	35	1870
12L614	A*	M-S-P	4	V-12	4⅛ x 5½	180-250	1800-2250	B**	....	E	....	....	64	47	35	2780
F1L612	A*	M-S-P	4	1	3⅛ x 4⅜	11	2100	O	....	H-E	....	....	19	21	31	441
F2L612	A*	M-S-P	4	2	3⅛ x 4⅜	22	2100	O	....	H-E	....	....	24	21	31	661
F4L612	A*	M-S-P	4	4	3⅛ x 4⅜	56-60	2800	B**	....	E	....	....	34	29	30	770
A4M517	A	M-S-P	4	4	5⅛ x 6¾	83	1500	B**	....	A-E	....	....	45	22	45	1984
6M517	A	M-S-P	4	6	5⅛ x 6¾	128-180	1500-1800	B**	....	A-E	....	....	62	23	45	2400
8M517	A	M-S-P	4	8	5⅛ x 6¾	170-200	1500	B**	....	A-E	....	....	77	23	45	2820
BA8M514	A	M-S-P	4	8	5⅛ x 6¾	250	1500	B**	....	A-E	T	....	82	22	46	3307
T2M425	A	M-S-P	2	2	5⅞ x 9⅞	52	600	O	....	A	....	....	51	36	57	4190
T3M425	A	M-S-P	2	3	5⅞ x 9⅞	80	600	O	....	A	....	....	61	36	57	5180
T4M425	A	M-S-P	2	4	5⅞ x 9⅞	105	600	O	....	A	....	....	71	36	57	6173
T4M525	A	M-S-P	2	V-4	7⅛ x 9⅞	210	600	O	....	A	....	D	61	59	57	5070
T8M525	A	M-S-P	2	V-8	7⅛ x 9⅞	420	600	O	....	A	....	D	82	59	57	8050
T4M233	A	M-S-P	2	4	8½ x 13	250	500	B**	....	A	....	D	103	47	73	10900
T8M233	A	M-S-P	2	V-8	8½ x 13	500	500	B**	....	A	....	D	110	63	77	15540
A4M428	A	M-S-P	4	4	8½ x 11	150	600	O	....	A	....	....	68	35	79	7716
A6M428	A	M-S-P	4	6	8½ x 11	230	600	O	....	A	....	D	92	35	79	10362
A8M428	A	M-S-P	4	8	8½ x 11	310	600	O	....	A	....	D	117	35	79	13670
V6M436	A	M-S-P	4	6	9½ x 14⅛	300	500	O	....	A	....	D	153	42	77	22046
V6M536	A	M-S-P	4	6	10⅝ x 14⅛	375	500	O	....	A	....	D	159	42	80	20944

(Duetz specifications continued on next page)

Klockner-Humboldt-Deutz *(Continued from preceding page)*

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Supercharge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
V6M545	A	M-S	4	6	12⅝ x 17¾	500	375	O	....	A	....	D	177	53	95	33069
V8M545	A	M-S	4	8	12⅝ x 17¾	660	375	O	....	A	....	D	212	53	95	41890
BV6M436	A	M-S-P	4	6	9½ x 14¼	450	500	O	....	A	T	D	153	42	77	22600
BV6M536	A	M-S-P	4	6	10⅝ x 14½	560	500	O	....	A	T	D	159	42	80	21500
BV6M545	A	M-S	4	6	12⅝ x 17¾	750	375	O	....	A	T	D	177	53	95	33950
BV8M545	A	M-S	4	8	12⅝ x 17¾	1000	375	O	....	A	T	D	212	53	95	43320
V6M366	A	M-S	4	6	16½ x 26	830	250	O	....	A	....	D	242	71	142	94140
V8M366	A	M-S	4	8	16½ x 26	1100	250	O	....	A	....	D	300	71	142	118170
BV6M366	A	M-S	4	6	16½ x 26	1250	250	O	....	A	T	D	242	71	142	93500
BV8M366	A	M-S	4	8	16½ x 26	1650	250	O	....	A	T	D	300	71	142	117950

* Air-cooled. ** Denotes Robert Bosch Equipment.

Maschinefabric-Augsburg-Nuernberg A. G.
H. A. Stechel, 149 Broadway, New York 6, N. Y.

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Supercharge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
W4V14	A	M-S-P	4	4	5.5 x 7.1	95	1200	B	....	A-E	....	....	...	...	...	2620
W6/14	A	M-S-P	4	6	5.5 x 7.1	170	1500	B	....	A	....	....	...	...	...	3430
W6V14M	A	M-S-P	4	6	5.5 x 7.1	250	1500	B	....	A	T	....	...	...	...	4290
WV17 5A	A	M-S-P	4	3-6 & 8	6.9 x 8.7	90-315	1000	B	....	A	*	....	...	...	...	.....
W6V22A	A	M-P	4	6	8.7 x 11.8	330	750	B	....	A	....	....	...	...	...	10020
W8V22A	A	M-P	4	8	8.7 x 11.8	440	750	B	....	A	....	....	...	...	...	12380
W6V22	A	M-P	4	6	8.7 x 11.8	610	750	B	....	A	T	....	...	...	...	.....
W8V22	A	M-P	4	8	8.7 x 11.8	815	750	B	....	A	T	....	...	...	...	.....
V6V22	A	M	4	V-12	8.7 x 11.8	660	750	B	....	A	....	....	...	...	...	15290
V8V22	A	M	4	V-16	8.7 x 11.8	880	750	B	....	A	....	....	...	...	...	19470
V6V22	A	M	4	V-12	8.7 x 11.8	1220	750	B	....	A	T	....	...	...	...	.....
V8V22	A	M	4	V-16	8.7 x 11.8	1630	750	B	....	A	T	....	...	...	...	.....
WV30	A	M-S	4	6-12†	11.8 x 15	720-2300	700	O	....	A	*	D	...	...	...	.....
L12V	A	M-P	4	12	6.9 x 8.3	500	1400	B	....	A-E	....	....	...	...	...	6580
L12VA	A	M-P	4	12	6.9 x 8.3	720	1400	B	....	A-E	T	....	...	...	...	7460
GV22	A	M-S	4	3-8	8.7 x 13	135-570	600	O	....	A	*	D	...	...	...	.....
GV28	A	M-S	4	3-8	11.2 x 16.5	205-880	428	O	....	A	*	D	...	...	...	.....
GV40	A	M-S	4	5-10	15.7 x 23.6	860-2280	300	O	....	A	*	D	...	...	...	.....
GV52	A	M-S	4	6-8	20.5 x 29.1	1500-3200	250	O	....	A	*	D	...	...	...	.....
GZ52/70	A	M-S	2	5-10	20.5 x 27.5	2000-4250	250	O	....	A	....	D	...	...	...	.....
GZ52/90	A	M-S	2	5-10	20.5 x 35.4	1650-4100	187	O	....	A	....	D	...	...	...	.....
KZ57	A	M-S	2	5-10	22.4 x 31.5	2350-6650	225	O	....	A	*	D	...	...	...	.....
KZ60	A	M-S	2	5-10	23.6 x 41.3	2840-7070	167	O	....	A	*	D	...	...	...	.....
KZ70	A	M-S	2	5-10	27.5 x 47.2	3480-8700	130	O	....	A	*	D	...	...	...	.....
KZ78	A	M-S	2	6-10	30.7 x 55.1	5400-11250	115	O	....	A	*	D	...	...	...	.....
DZ53	A	M-S	2	5-10	20.9 x 31.4	4050-8100	215	O	....	A	....	D	...	...	...	.....
DZ60	A	M-S	2	5-10	23.6 x 43.3	4275-8550	130	O	....	A	....	D	...	...	...	.....
DZ72	A	M-S	2	5-10	28.3 x 47.2	6220-12450	120	O	....	A	....	D	...	...	...	.....

* *Available as supercharged or naturally aspirated engine. Horsepower range includes both.* † *6, 8, 10 & 12. Fuel System—Robert Bosch.*

Mercedes-Benz———Europa Motors, Inc.
341 East 62nd St., New York 21, N. Y.

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Supercharge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
MB821A	A	S-P	4	1	5.90 x 7.48	21	800	B	....	H	....	....	52	34	37	1500
MB202B	A	M-S	4	2	5.51 x 8.27	55	1200	B	....	H-A-E	....	....	37	31	45	1620
M203B	A	M-S	4	3	5.51 x 8.27	82.5	1200	B	....	A-E	....	....	48	31	46	2095
M204B	A	M-S	4	4	5.51 x 8.27	110	1200	B	....	A-E	....	....	58	31	48	2645
OM636	A	M-S	4	4	2.95 x 3.94	32	3000	B	....	E	....	....	29	21	30	365
OM312	A	M-S	4	6	3.54 x 4.72	75	2400	B	....	E	....	....	44	26	42	795
OM67/8	A	M-S	4	6	4.13 x 5.51	90	1800	B	....	E	....	....	54	30	44	1655
OM315	A	M-S	4	6	4.41 x 5.51	120	1800	B	....	E	....	....	56	30	48	1700
OM315A	A	M-S	4	6	4.41 x 5.51	150	1800	B	....	E	T	....	63	30	49	1765
MB846A	A	M-S-P	4	6	5.90 x 7.48	225	1500	B	....	E	....	....	73	32	60	3640
MB846AB	A	M-S-P	4	6	5.90 x 7.48	300	1500	B	....	E	T	....	87	33	60	3890
MB836B	A	M-S	4	6	6.89 x 8.07	330	1500	B	....	E	....	....	76	45	57	3530
MB836BB	A	M-S	4	6	6.89 x 8.07	500	1500	B	....	E	T-M	....	76	48	64	4080
MB820B	A	M-S	4	12	6.89 x 8.07	660	1500	B	....	E	....	....	86	50	61	5025
MB820BB	A	M-S	4	12	6.89 x 8.07	1000	1500	B	....	E	T-M	....	87	53	77	5620
MB820BB	A	M-S	4	12	6.89 x 8.07	1250	1500	B	....	E	T*	....	87	53	77	5800
MB515	A	M	4	20	7.28 x 9.84	2500	1630	B	....	A	T	D	158	63	89	10305

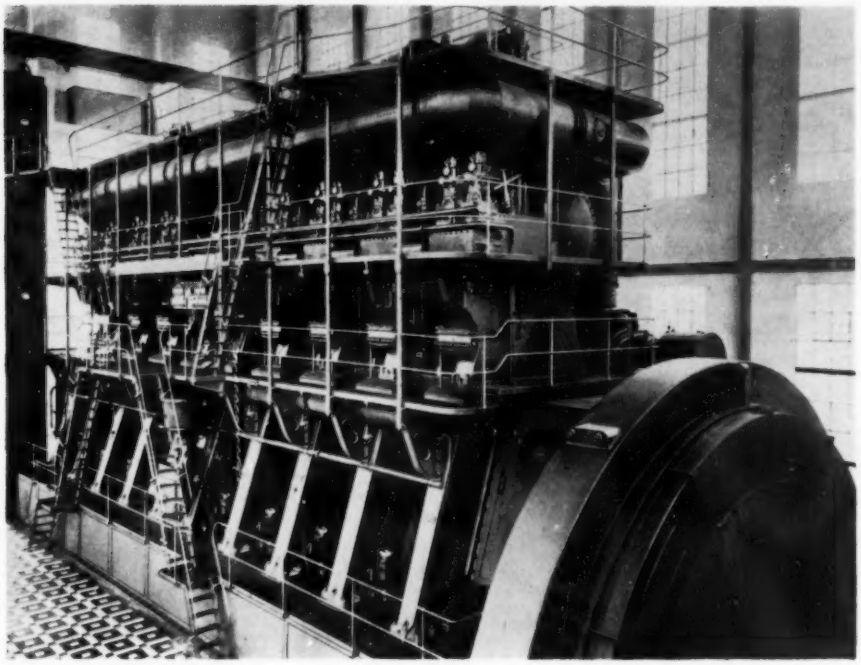
* *Heavy duty. Injection equipment is Robert Bosch. Engines have precombustion chambers.*

Sulzer Bros. Ltd., New York
50 Church Street, New York 7, N.Y.

Model	Type	Use	Cycle	No. Cyl.	Bore & Stroke In.	Cont. HP.	Cont. R.P.M.	Fuel System	Ignition	Start	Supercharge	Rev. Gear	Length In.	Width In.	Height In.	Weight Lb.
BA22	C	S	4	3-8	8.67 x 12.6	200-600	500-600	O	....	A	T	....	...	...	...	.....
BA29	C	S	4	6-8	11.4 x 14.4	700-950	500	O	....	A	T	....	...	...	...	.....
BA36	A	S	4	8	14.4 x 23.6	2000	425	O	....	A	T	....	...	...	...	.....
T24	A	M	2	4&6	9.46 x 15.75	300&450	400	O	....	A	....	O-D	...	...	...	.....
T29	A	M	2	4-9	11.4 x 19.75	400-900	300	O	....	A	....	D	...	...	...	.....
T36	A	M-S	2	4-10*	14.4 x 23.6	600-1600	250-300	O	....	A	....	D	...	...	...	.....
T48	C	M-S	2	4-12†	18.9 x 27.5	1400-4200	225-250	O	....	A	....	D	...	...	...	.....
T56	A	M	2	5-8	22.1 x 39.4	2000-3200	155	O	....	A	....	D	...	...	...	.....
SD60	A	M	2	5-10	23.6 x 41	2500-5000	150	O	....	A	....	D	...	...	...	.....
SD72	A	M	2	5-12	28.3 x 49.3	3500-8400	125	O	....	A	....	D	...	...	...	.....
SF72	C	S	2	6-12	28.3 x 35.4	4500-9000	187	O	....	A	....	....	...	...	...	.....
LDA19	A	P	4	6	7.5 x	420	1100	O	....	E	T	....	...	...	...	.....
LDA22	A	P	4	6	8.67 x	570	950	O	....	E	T	....	...	...	...	.....
LDA25	A	P	4	6 & 8	9.85 x	735 & 960	850	O	....	E	T	....	...	...	...	.....
LDA28	A	P	4	6, 8 & 12	11.0 x	920-2000	750 & 935	O	....	E	T	....	...	...	...	.....
LDA31	A	P	4	12	12.3 x	2250	935	O	....	E	T	....	...	...	...	.....

* *4 to 8 for stationary.* † *5 to 12 for marine.*

Every so often we receive inquiries concerning the world's largest diesel. The frequency makes this an item of general interest, so we are taking this opportunity to tell you a little about this largest of diesel engines and perhaps answer some of your questions.



World's Largest Diesel

TIPPING the scales at about 240,000 lb, this giant diesel stands about 40-ft high and has an overall length of 80 ft. It was built for the H.C. Orsted Central Electricity Works, Copenhagen, Denmark, by Burmeister and Wain, and installed in 1933. Rated capacity is 12500 kw with a maximum overload capacity of 15,000 kw. This is developed by the eight double-acting, uniflow-scavenged cylinders which have a bore and stroke of 33 in and 59 in respectively.

An interesting design feature of this large 2-cycle engine is that of the piston-type exhaust valves. These are located at the top and bottom of the cylinders and are actuated by rigid tie rods, connected through a toggle mechanism to a chain-driven camshaft.

Scavenging air from the 4-lobed, chain-driven rotary blowers is admitted to the cylinders through a belt of tangentially-directed ports located around the center of the cylinder wall. Pressure lubrication is provided with both the exhaust pistons and power pistons being oil-cooled. Cylinder lubrication is provided by chain-driven mechanical, force-feed units.

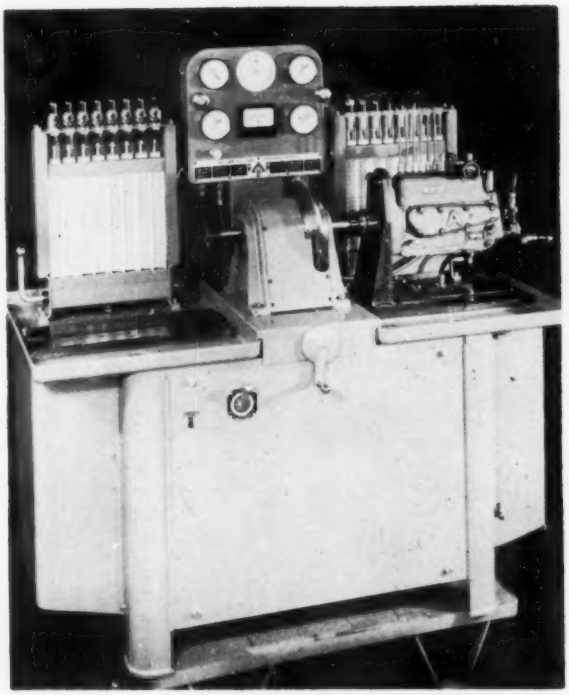
To compensate for dangerous vibration in the engine crankshaft during starting or stopping, a vibration damper has been installed at the free end of the engine. This consists of a rotating flywheel which, through the use of hydraulic cylinders, can be coupled or uncoupled, preventing dangerous torsional vibration in the crankshaft.

Fuel injection is of the solid or mechanical type, with fuel consumption in the order of 0.396 lb per hp-hr or 0.53 lb per kw-hr at full rated load of 12500 kw.

Incidentally, there are four walkway levels around the engine, and an elevator. The elevator can be seen in the accompanying illustration at the left of the engine.

Waste heat recovery is also employed in connection with the unit. Heat from both the cooling water and engine exhaust are efficiently utilized to heat buildings as far as a mile away. Waste heat recovered from the engine is also put to other profitable use. Approximately three btu per kw are recovered under normal load.

A human interest note is reported in an early report on the plant. During the installation of the engine, a blackbird built her nest in one of the brackets supporting the exhaust manifold. As the installation proceeded and the blackbird hatched her young. The young birds were not ready to fly when the engine was started, so the family remained undisturbed. When able to fly, the blackbird family left the plant. This is a commentary on the smoothness of operation.



Versatile Calibrating Stand

Some details of a new calibration stand for multi-plunger and distributor-type fuel injection pumps.

Overall view of calibration stand with International-Harvester pump mounted in position for testing.

INJECTION pump calibration stands serve two purposes. The first of these is explicit in the name—calibration. The second is incidental to the calibration process but is very important, particularly from a cost standpoint. It is testing of the pump's component parts. A pump, new or old, will need calibration, but in the case of used pumps, evaluation of the condition of components is also highly desirable.

Unless there is some way to determine component condition, common caution dictates that parts showing the slightest visual cause for suspicion be discarded. This is often wasteful and expensive; it breeds a "change-it-to-be-safe" policy. A good calibration stand, or more accurately, a calibration and test stand, will show the parts to be discarded and those to be continued in service on the only sound basis for decision—how they perform.

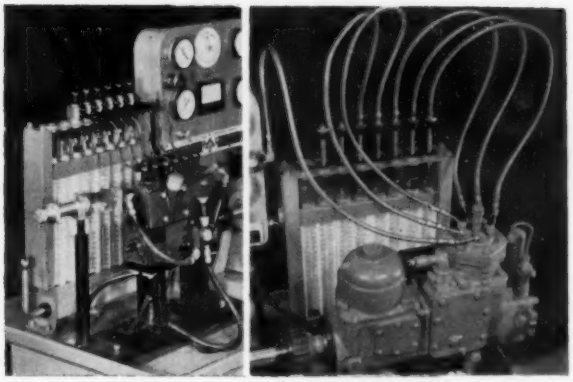
Injection equipment is precision-built to do a very precise job, and it follows that testing equipment must be equally accurate. This means that they cost money to build. The fellow with only an engine or two would have a hard time justifying the expense; he must use some of the excellent repair facilities where the volume of work will support the cost of the tester. And whether it be a commercial or a private repair shop, a high degree of utilization is most desirable.

This brings up another point. In most cases, several types of pumps will have to be checked. The testing and calibration process will vary with the make of pump, and mountings will differ. The manufacturer's specifications will have to be met in all cases and the proper fixtures, connectors, piping, and test nozzles will have to be used. Flexibility of application, then, will increase the degree of utilization.

On the basis of all these requirements, let's take a look at Bacharach Industrial Instrument Company's new calibration stand and see how it meets the need. It was developed with the idea of maximum flexibility in testing and also on the premise that convenience of operation means a better job in the least amount of time. For example, it has a double-end drive. This enables right and left hand pumps to be mounted so that openings for adjustments face outward for easy access. Also, setups for different pumps can be left substantially intact on each side. This can be a big time saver.

Other features will be discussed along with the functions to be performed. First, the pump must be driven. The stand will handle pumps for up to 8-cyl engines. Standard accessories provide for testing the American Bosch Type APE pumps in sizes A, B, and BB; their Type PSB pump; Cummins Models A, H, JS, and NH single- and double-disc pumps; and International-Harvester's single- and twin-plunger pumps. Others can be tested with optional accessories. Since the mountings vary, different types of supporting fixtures bolt to the bedplates to hold the pumps and line them up with the drive. All the necessary adaptor couplings are provided.

You don't just hook a motor to a pump and drive it; power must be smooth and the rpm adjustable. Most pumps can be made to deliver the correct amount of fuel at one speed. However, the important thing is that the pump must meet requirements throughout its normal speed range. This means tests at different speeds and to



Above — American Bosch Type APE pump on test. Note precision control rack fixture to position rack.

Upper Right — Cummins pump mounted for testing. Head pressure is being checked through high-pressure line in foreground running to high-pressure gauge connection on the panel board at the left edge.

Right — Mounting fixtures for different Cummins pumps. Similar sets are available for other makes.

meet this need, a 2-speed motor, coupled with a variable-speed drive, gives precise speed control over the required range. The motor is reversible to handle different pump rotations. A 5-position switch and a magnetic starter provide control.

This combination of controls, in addition to convenience, provides safeguards. For example, the magnetic starter provides both overload and no-voltage protection for the motor. The motor control switch can be moved to any position without energizing intermediate positions since the start of movement de-energizes the magnetic starter and stops the motor. When it reaches the terminal position, it must be pulled to again energize the magnetic starter.

Vee-belts turn the double-end drive. The drive incorporates a flywheel, the inertia of which smooths out any effect of intermittent loading. Drive speed is indicated on a tachometer which is monitored by a speed-prover calibrated in rpm. Crosschecks assure rpm accuracy.

The idea of calibration is to see that the pump delivers the same amount of fuel to each cylinder at given speed settings. This indicates balance. The amount delivered in a given number of pump strokes at the calibrating speeds is measured. This is a check for pump and delivery valve condition. For accuracy, the conditions in actual service, or in some cases test conditions correlating with service conditions, must be accurately maintained.

Fuel oil is stored in tanks in the base of the stand. It gets primary and secondary filtration equivalent to that in actual service. This fuel is available to a priming pump that can be used to fill the systems. The supply pumps incorporated in the fuel injection pump under test are normally used to supply fuel, although there is a transfer pump incorporated in the stand. This permits a test of integral pump operation and gauges are provided for this purpose. Suction developed on Cummins primary pumps and transfer pumps on other types is indicated. Discharge pressures of all pumps are also shown. Head pressures on Cummins pumps can also be measured on a high-pressure gauge.

All gauges, along with other controls and connections, are located on a central panel. Flanking the panel on each side are the graduate assemblies. Each consists of eight graduates at the top of which are the deflectors, the plastic spray collectors, and mountings for the test nozzles or test connections (Cummins). Each pump outlet is connected to one of these nozzles or connections by tubing.

To start a test run for checking delivery quantity and balance, the pump is brought up to the test speed. The fuel controls are set, the speed-prover set back to zero, and the automatic counter started. This automatic counting circuit is energized by selecting and operating either the 100-stroke or the 500-stroke count lever. This action deflects the flow of fuel from the spray collectors to the graduates and starts the speed-prover. At the conclusion of the count, the fuel is again deflected back to the drain basin and the speed-prover stopped.

A nicety in the electrical system is the transformer and rectifier circuit that energizes the automatic counter circuit including the spill deflectors and the speed-prover. Operation of the desired count lever is all that is necessary for simultaneous functioning of the system.

The number of revolutions indicated on the speed-prover can be checked against rpm to insure that speed was correct. Volume of oil can be measured by reading the graduates and a glance at the liquid levels shows the condition of balance. When all the data has been recorded, a dump valve assembly is operated to drain the graduates. Further tests can be made at different speeds or adjustments made prior to further testing.

On those pumps requiring timing (axial location of the plungers within the barrels), a timing disc is provided on the left side of the flywheel. The scale is graduated in degrees and is movable to facilitate timing of individual pumping elements. The "flow" method of timing is suggested and details are given in most manufacturers' manuals. The stand's transfer pump is used to provide the fuel flow. Its discharge characteristics are suitable for this operation.

It is evident that a lot of thought went into the design of this calibration stand and that it can check out all the essential operating characteristics of a number of different injection pump designs. It provides for calibration, balance, and internal timing of the injection pumps. It checks the integral fuel supply pumps and can also be used to check governor reactions. This particular unit was built with the idea of maximum adaptability and utility. Another unit is built solely for calibration and testing of Cummins pumps.

Control Wheel Slip to Reduce Flashovers

One railroad's experience shows that effective wheel slip protection reduces flashovers in traction motors and generators. This substantiates the theory of correlation between armature speed and flashovers.

by J. R. Schoonover and H. R. Stiger*

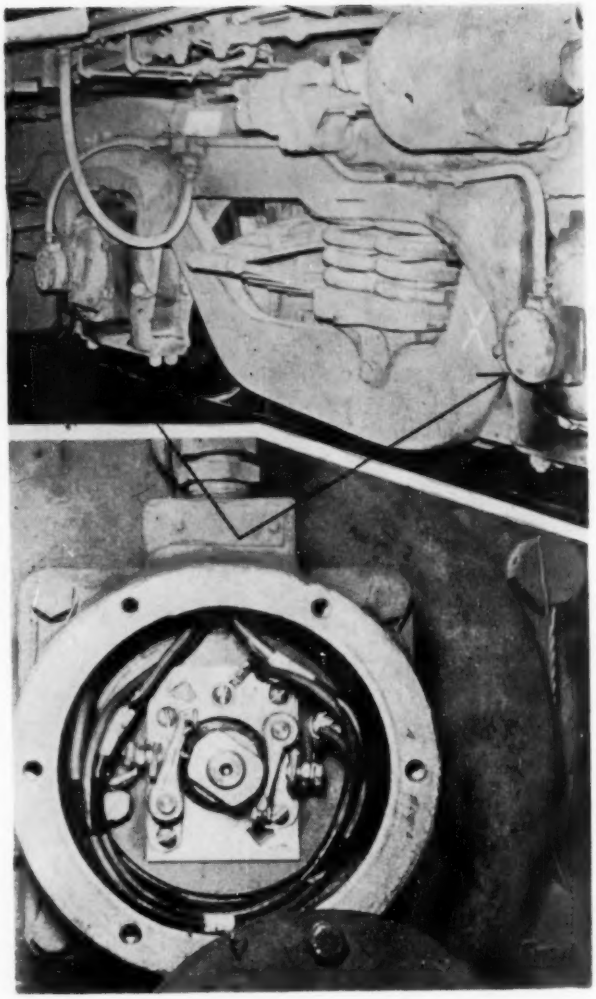


Fig. 1—Type of axle switch used, and installation on truck of Lehigh Valley Railroad locomotive number 601.

IN 1948, the Lehigh Valley Railroad substituted diesel-electric locomotives for steam power in passenger service. Shortly thereafter, trouble was experienced in the maintenance of traction motors and generators. Certain characteristics of these difficulties indicated that they were the results of wheel slippage.

Parts of the railroad's main line between New York and Buffalo are quite mountainous. In one territory the grade reaches a maximum of 1.8 per cent. Investigation showed that an excessive amount of wheel slip and flashing on both traction motors and generators was occuring in heavy passenger service over these grades, particularly in bad weather, when there was frost on the rail, or when falling leaves accumulated on the track.

Many difficulties encountered could be traced to overspeeding of the motors during wheel slip.

1. Armature bands were shifting and also breaking. This necessitated motor removal between normal overhaul periods and reduced the mileage per motor outage to a low figure.

2. Band shifting allowed the coils to flare out and lock the armature, causing further damage and locking the axle and driving wheels.

3. Severe traction motor flashover often required motor removal for cleaning before returning it to service. Frequently, armature coil leads were found to be loose in the commutator risers.

4. Traction motor flashovers usually resulted in main generator flashover. The cumulative effects necessitated extra maintenance on the generators such as cleaning of brush holders and commutator string bands, renewal of brushes, and re-surfacing of commutators. In the most severe cases it was necessary to remove the generator for clean-up.

In seeking a solution, consideration was given to changing gear ratio on the locomotives. As they were geared for a maximum speed of 80 mph, it was thought that a lower gear ratio (higher maximum speed) might alleviate the trouble. However, after further investigation and consultation with the builder's engineers, it was

* The authors represent, respectively, the Lehigh Valley Railroad and the General Electric Company. The text is a condensation of a paper, "Flashovers of Diesel Traction Motors and Main Generators", presented before the Land Transportation Section, AIEE, in January, 1954.

decided to apply the General Electric Company's wheel slip-slide detecting and protective system then in the final stages of development. Trial installation was made on several passenger locomotives. Later, it was extended to the entire fleet.

Test Equipment

At the close of 1951 a series of tests was conducted jointly by Lehigh Valley and GE on a 2000-hp road passenger locomotive. Observations were continuous from December 16, 1951 to January 17, 1952 in regular scheduled service between Buffalo and New York. The locomotive was equipped with the GE wheel slip-slide protection system consisting of direct axle-speed sensing units on each axle, and a speed-comparison panel.

When the speed difference between the slowest and fastest axles reaches a predetermined value, the panel acts to momentarily reduce traction generator excitation, sound a buzzer, and light a signal at the engineman's position. If the speed differential is not corrected, after a suitable time delay, the panel acts to remove generator excitation, return the diesel engine to idle speed, and sound an alarm bell. The engineman is instructed to check for sliding wheels before resetting the panel.

In addition to this equipment, the locomotive was fitted with direct-drive, 10—120-mph speed recorders lent by the Barco Manufacturing Company. One was connected to each motored axle and a continuous recording was taken for 24,000 miles. These recordings showed axle speeds for all locomotive operations during the test period. The recorder connected to motor No. 2 axle had in addition, two electrically operated pencils which recorded (1) when power was on the speed comparison panel and (2) when the panel operated to correct wheel slip.

Theory of Wheel Slip and Flashovers

Test showed that wheel slips occurred over the entire speed range. They occurred also in different motor connections and field strengths. Thus, in dealing with general theory, there will be no detailed attempt to deal with any specific motor connections and field strengths.

In examining the theory, consider the voltage induced in an armature coil as it passes under a pair of pole pieces. The upper part of Fig. 5 shows a complete armature coil and commutator segments to which it is connected. Each side of the coil has a voltage (Ecs) induced in it as it moves under a pole piece. These two voltages add directly to produce the voltage between commutator segments.

This voltage varies with coil position and armature speed, as shown graphically in the bottom of Fig. 5. Various voltage curves are here identified by locomotive speeds. This is possible since armature speed is directly proportional to locomotive speed. These curves show that voltage between segments reaches a maximum each time the coil passes under a pair of poles. This value is called peak volts per bar. A glance at the voltage curves for various speeds shows that peak volts per bar increases with speed.

Now, suppose that wheel slip occurs. Motor speed on the slipping axle will increase and its peak volts per bar will rise. If the speed goes above its normal value, the peak volts per bar will exceed the normal maximum value. The higher the speed, the greater the peak volts per bar. Under some conditions, a value may be reached that will cause arcing between commutator bars. This arcing will ionize the air at the commutator surface, making a conducting path between all segments. As a result, segment arcing will increase until the conducting path reaches between brush holders and the motor flashes over.

Commutator condition will to a great extent determine the peak volts per bar at which the machine will flash over. In a new machine, the insulation between commutator segments is at its best and the voltage required to cause arcing between segments will be a maximum. In service, a clean commutator will naturally require a greater voltage between segments to cause arcing than will a dirty one. If conducting material such as oily carbon dust or copper grindings from reconditioning is allowed to accumulate between segments, voltage required to start arcing will be lowered. So, as commutator condition becomes poorer, the machine will flash over at less peak volts per bar (See Fig. 6). Thus, proper maintenance of tractor motor commutators will reduce flashovers.

If commutator condition is bad enough, the critical peak volts and corresponding speed may be so far reduced as to fall in the normal operating range. A properly maintained commutator, on the other hand, will stand an appreciable increase in speed above normal before it flashes over due to peak volts per bar. However, motors should not be overspeeded for other reasons, one being the mechanical limitations. Also, overspeed may produce

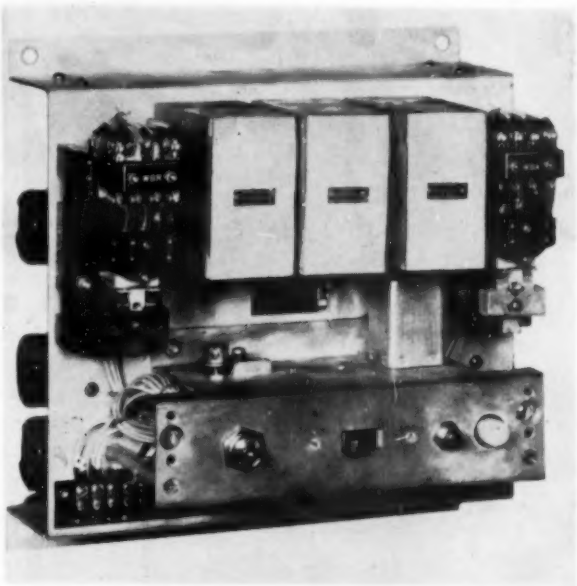


Fig. 2—Wheel slip-slide detection panel of the type installed on the test locomotive.

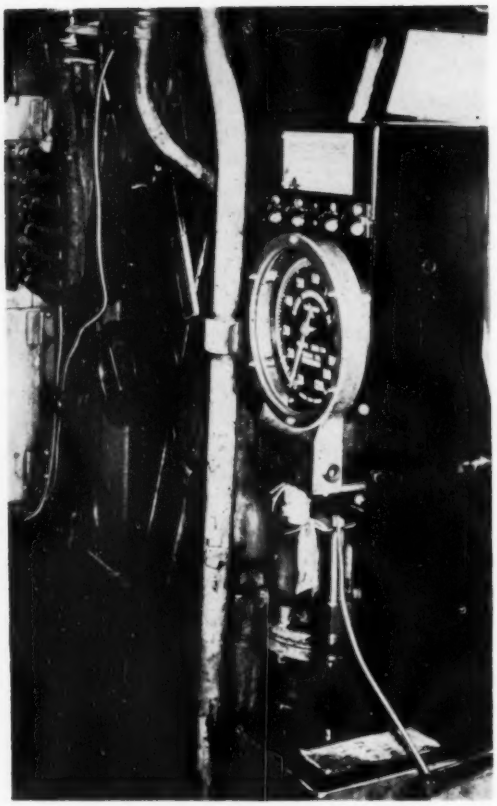


Fig. 3—The Barco speed recorder, installed in the test locomotive

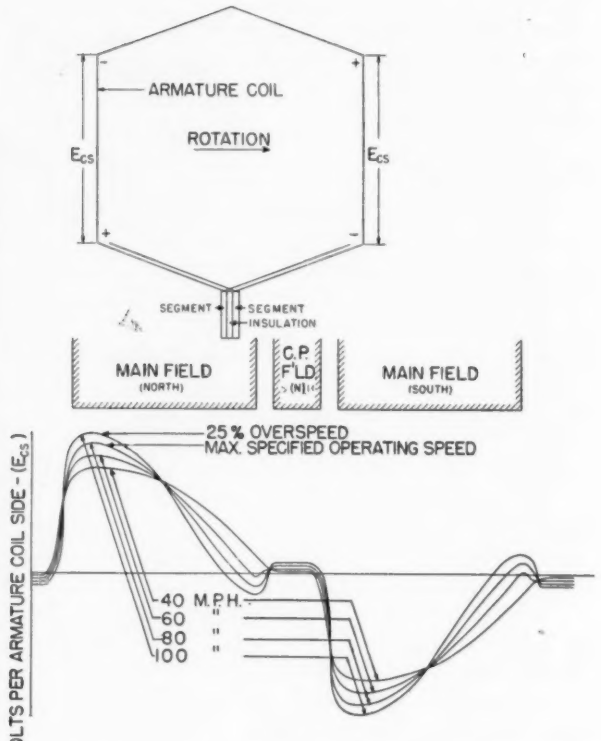
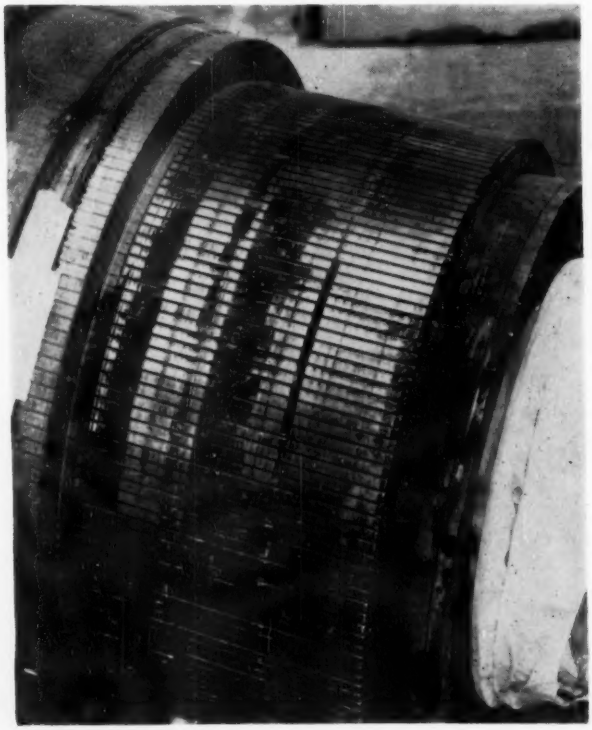


Fig. 5—Voltage variation with changing coil position and armature speed.

Fig. 4—Traction motor commutator damaged by flashover.



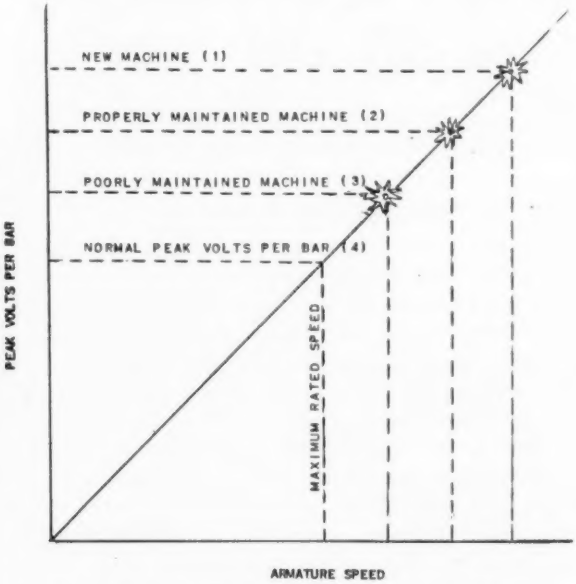


Fig. 6—Illustrating relationship of traction motor condition to critical armature speed and peak voltages produced.

excessive stresses in the commutator, causing it to become rough. This may then cause brushes to jump which can result in flashover.

Once a traction motor flashes over, it almost invariably causes the main traction generator to flash over also. The traction motor flashover acts as a partial short circuit on the generator. The resultant current surge produces ex-

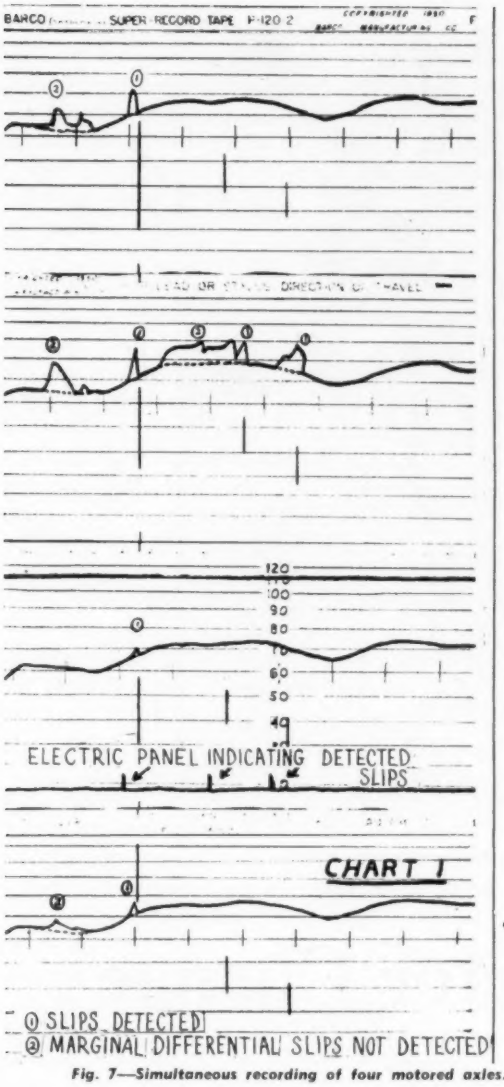


Fig. 7—Simultaneous recording of four motored axles.

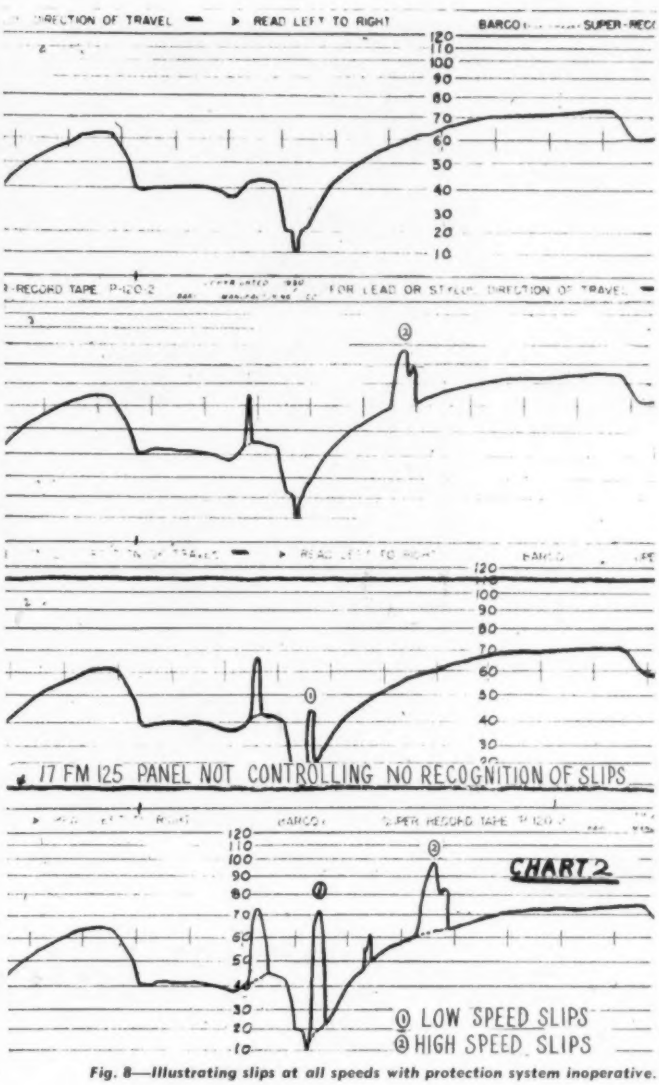


Fig. 8—Illustrating slips at all speeds with protection system inoperative.

cessive sparking on the generator commutator. This ionizes the air along the commutator surface and forms a conducting path between brush holders. The generator then flashes over just as described for the traction motor.

It appears evident that a reduction in the per cent of overspeed on traction motors will reduce the number of flashovers on both the motors and the main traction generator. If it were possible to devise a wheel-slip scheme which would stop slips before they start, flashovers from this cause would be eliminated. At present, it is not known how to do this. We must resort to a system that will keep the motor overspeed to a minimum, thus avoiding the majority of overspeed flashovers.

With the original wheel-slip system used on Lehigh Valley passenger locomotives, overspeeds up to 35 per cent above permissible maximums were recorded. At that time, great trouble was being experienced with flashovers and their damage. To overcome this, GE applied its new wheel slip-slide system. Service tests on the same locomotives showed appreciably faster response. Maximum overspeeds recorded were approximately 17 per cent above maximum permissible speed.

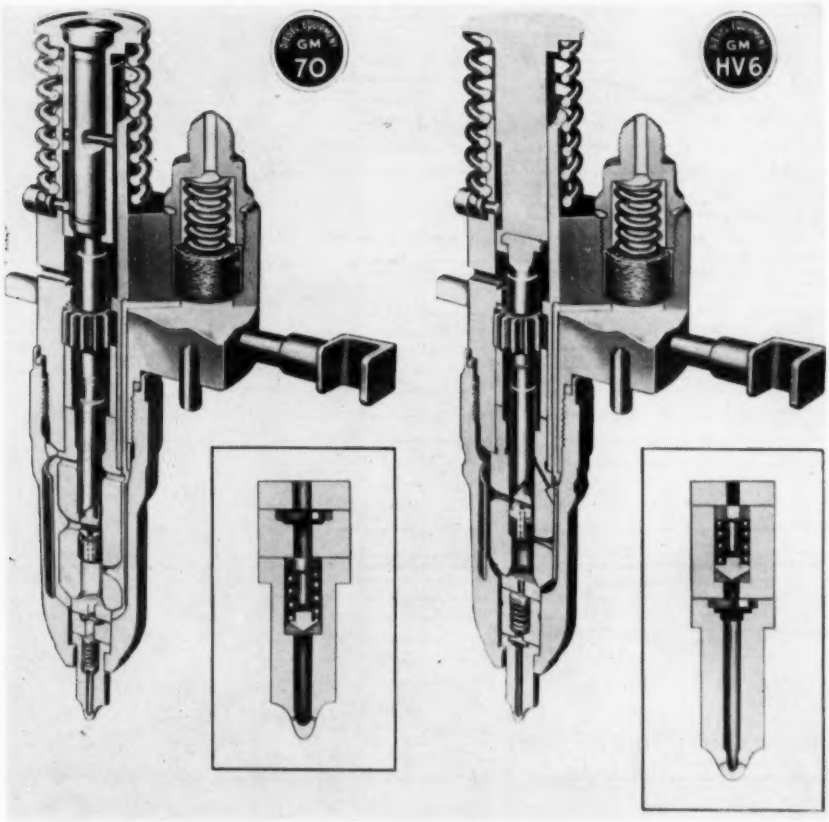
Analysis of Test Data

These tests showed that wheel slips occurred over the entire locomotive speed range. It follows that wheel slip was not directly related to motor connection or field strength. It is difficult to say how many wheel slips resulted in motor flashovers. Neither can it be said in what motor connections and field strengths they occurred. No accurate record was kept of this. As will be pointed out, use of an improved wheel-slip detection system greatly reduced the number of flashovers.

Selection has been made of two sections from the traces made by Barco speed recorders during the tests. To facilitate comparison, simultaneous recordings of the four instruments have been placed together on a single chart.

Chart 1, Fig. 7, illustrates the case of all four motored

(*Continued on page* 146)



Cutaways show "before" and "after" construction. Insets show valve details.

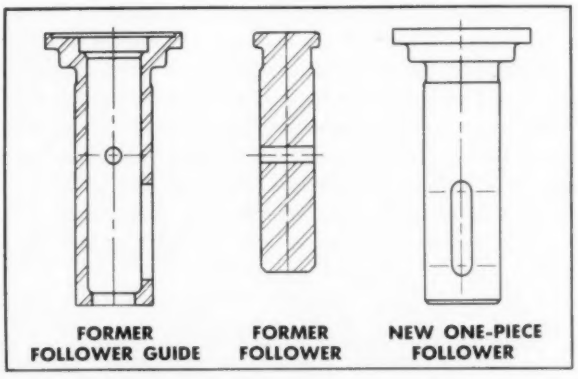
Series "71" Injector Change

IF you are concerned with the maintenance, operation, and/or repair of GM Series "71" engines, this recent injector change will be of interest to you. From all outward appearances, this new "high-valve" injector assembly is similar to the unit formerly used.

Instead of the "60", "70", or "80" which we are used to seeing, the identification tag will bear the figures "HV6", "HV7", or "HV8". The "HV" stands for "high-valve", a designation derived from the higher location of the injector valve in the new unit. The "high-valve", as it is called, is one of the major differences between the new assembly and the unit formerly used.

With the injector valve in a higher position, the valve spring's exposure to high cylinder temperatures is lessened. In addition, the relocation of the check valve to a point below the injector valve and spring will serve as additional protection against compression pressures and heat which would otherwise reach the valve assembly. This arrangement is designed to lengthen the life of the valve spring.

Detroit Diesel has introduced a new injector into the production of the GM Series "71" Engine.



New simplified follower guides will be available as a replacement for both former models and "HV" injectors.

Former injector valve nuts with different inner contours can be used with high valves with a conversion kit.

With the addition of the high valve, a number of other changes were incorporated. These included a shorter plunger and bushing assembly, shorter spill deflector, new injector valve, relocation of the flat check valve, new spray tip, and a new injector nut. During the redesign, a one-piece follower and heavier follower spring were incorporated. All future production units will be of this type.

Future Servicing

The new follower, follower spring, and plunger and bushing assembly are the only types that will be available as replacement parts. To facilitate servicing, two types of kits have been made available. The first kit is for servicing existing units and includes a plunger and bushing assembly and a spray tip spacer, the latter part being necessary to compensate for the shorter plunger and bushing assembly.

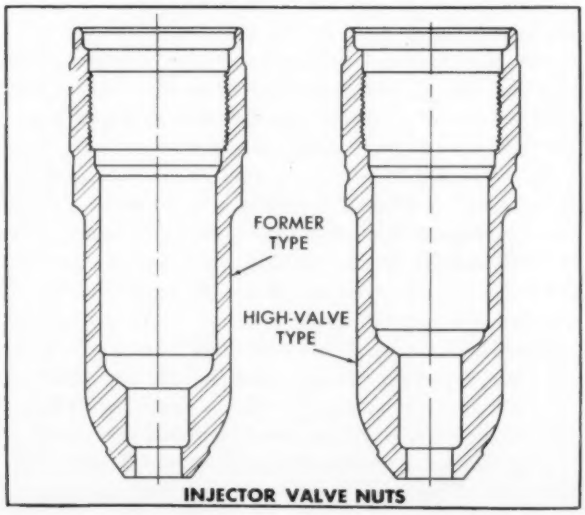
The second kit is for conversion of the former injectors to the HV type. This kit includes a plunger and bushing assembly, injector valve, valve seat, valve spring, valve stop, valve cage, valve seat guide, spray tip, flat check valve and number tag. It is recommended that the flat check be replaced if it has been in service for some time and a definite wear pattern is apparent. The valve seat guide holds the valve seat and cage in line as shown. In new injectors, the inner contour of the injector nut does the same job.

New assemblies, converted units, or those with a new plunger and bushing assembly are all interchangeable and may be used in any combination in an engine, as long as all injectors are of the same in mm capacity.

Testing and Servicing

There has been no change in the testing data. It remains the same for both the HV and former unit. Servicing, with respect to the disassembly, inspection, cleaning, and reconditioning of injector components as well as the tools, also remain the same.

At this point, it might be well to stress that there is no substitute for "knowhow" and adequate facilities such as a clean working area and proper tools in servicing injection equipment.

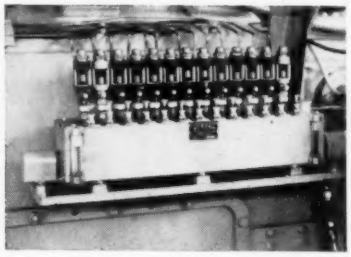


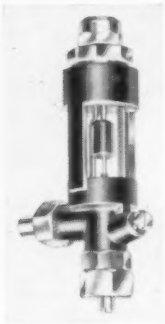
INJECTOR VALVE NUTS

What Do You Know!

Here are some questions to test your general knowledge of the diesel field. Make your selections, then turn to Page 138 to check them.

1. Oxidation of lubricating oils is self accelerating once it starts. Principal factors affecting oxidation include:
   a. Presence of oxygen and high temperatures
   b. Presence of metals and metallic compounds
   c. Presence of sludges
2. Filters using Fuller's earth or activiated clay are very effective in removing oil-soluble oxidation products in all types of lube oil, including straight mineral oils and the additive type.
   a. True b. False
3. The terms "wet" and "dry" when applied to centrifugal purification of lube oils refer to:
   a. The relative amount of water in the lube oil
   b. Whether water is intentionally added
   c. Whether the centrifuge is set for one- or two-liquid discharge
4. If a fuel injection pump can be made to deliver the required amount of fuel in a given number of strokes at one fixed speed, its condition is satisfactory.
   a. True b. False
5. "Internal timing" as applied to multi-plunger fuel injection pumps refer to:
   a. Proper setting with respect to the engine's crankshaft
   b. Setting plungers to start injection the same number of degrees apart
   c. Proper axial location of the plungers in the barrels
6. The dangers of overspeeding locomotive traction motors are that which of the following might occur:
   a. Mechanical damage to the commutator
   b. Flashover in the traction motor
   c. Flashover in the main generator
7. Wheel slip on locomotives will occur at different speeds and various motor connections and field strengths.
   a. True b. False
8. Better engine balance will reduce foundation requirements.
   a. True b. False
9. Gas and dual-fuel engines operating where high ambient temperatures are expected generally have provisions for cooling the scavenging air. The reason is—
   a. To reduce the possibility of detonation
   b. To lower charge temperature at start of combustion
   c. To obtain better air/fuel mixture





Complete lubricator and bobber sight feed.

Bobbers for Force-Feed Lubricator Calibration

Clouding of mechanical lubricator sight-feed glasses became a more acute problem when additive-type oils came into use for cylinder lubrication. Here is one approach to a solution.

USE of the additive-type oils for upper cylinder lubrication is making it tough on a lot of operators with engines having force-feed mechanical lubricators. There is no question about the effectiveness of these oils in many applications; they do a superior job in their main function—lubrication. It is just that they cause minor but nonetheless troublesome problems by simply doing what comes naturally.

Most mechanical lubricators have sight-feed glasses in which glycerine and water mixtures are commonly used. They are calibrated by counting the drops per unit of time as they float up through the fluid. These drops, incidentally, are not each the result of a pump stroke, nor do they indicate the amount of oil delivered at the cylinder per pump stroke. Instead, they are each the accumulation of several pump strokes. When the drop is of sufficient size to break away from the orifice, it floats lazily to the top of the fluid where it joins the pool of oil waiting to be delivered.

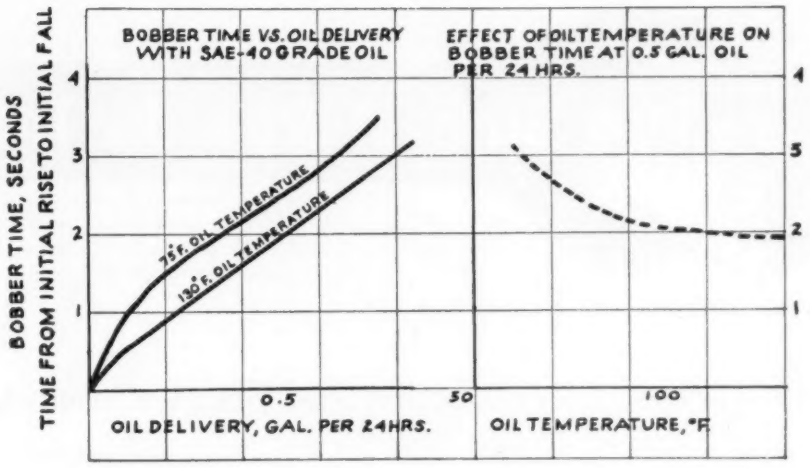
If you are going to calibrate the lubricator by the drop method, you have to see the drops. This is where trouble arises. The detergents and other additives in the oil react when in contact with the fluid in the sight glass. They try to do exactly what they are supposed to do in the engine cylinder—keep it clean. They emulsify, dissolve, disperse, and otherwise react with the fluid, to produce clouding.

Pretty soon the glass is so clouded or incrusted that you can't see the drops. Cleaning and refilling is a time-consuming job involving some expense. In acute cases it can become quite a problem in manpower and cost. (*Such a case was reported on page* 62, *November*, 1953, DIESEL POWER—*Ed.*)

Since it is impractical to make the oil selective in its reactions, the approach has been to find a fluid that would be inert to the additive reaction. A great number of different fluids have been tried with varying success. Some promising new ones are on the way.

One manufacturer of these lubricators, McCord Corporation, tried a different tack. Why not eliminate all fluid and use some other means of indicating oil delivery? It all started at the Topock compressor station of the Pacific Gas and Electric Company, where a particularly bad situation developed. The additive reaction was so pronounced that in addition to clouding, the glycerine-water mixture, soluble in the oil, was carried over into the delivery lines and when the unit was shut down, caused incrustations to form.

The plant foreman, W. V. Adler, collaborated with Shell Oil Company engineers in trying to lick the problem. All sorts of fluids were tested with no particular success. One of the Shell engineers then suggested the use of a metallic indicator developed by McCord for other applications. This would eliminate the fluid and hence



Calibration charts worked out for force-feed lubricator having metallic bobber indicators. Both charts apply for lubricators on Cooper-Bessemer GMW engines at speeds corresponding to 250-rpm engine speeds.

the reaction. It was tried with considerable success.

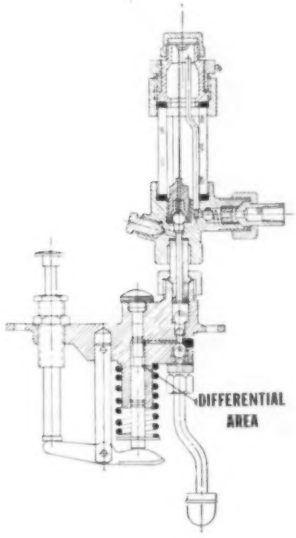
These bobbers were generally intended only to indicate that oil was being delivered. They were made of brass with a steel stem. A close-fitting pin works in the standard orifice where the oil drop normally forms, and rises and falls with each plunger stroke. It is a positive indication of delivery (one function of sight-feeds in general), but the problem of calibration still remains.

It must be realized that calibration by drop is only a compromise in the interest of practicality; it's a convenient way of doing it. The question is, "How big is a drop?" Variations in volume of 50 to as high as 75 per cent have been reported. Drop size will depend on the oil, its viscosity at the particular operating temperature, the specific gravity of the fluid, orifice size, shape and condition, interfacial tensions, etc., etc. These variables apply not only between lubricators on different engines, but in a single multi-unit lubricator.

Since the time of initial rise to initial fall of the bobber was found to be proportionate to the oil delivery per stroke for a given set of conditions, this was the reference used. Temperature as affecting viscosity was the major variant. The Shell engineers worked out a calibration chart on this basis for the particular engines involved. Since that time, McCord has done a lot of work in establishing calibration data. Bobbers are made up with calibrations and there is an indicator on the glass.

Calibration by this method is dealing with individual pump stroke delivery rather than an accumulation as in the case of the drops. The amounts of oil delivered are minute. Modern oils are doing such a good job that the gallons per unit of time have been reduced. Also for economic reasons, it is desirable to keep the total amount of oil delivered to the minimum required for adequate lubrication.

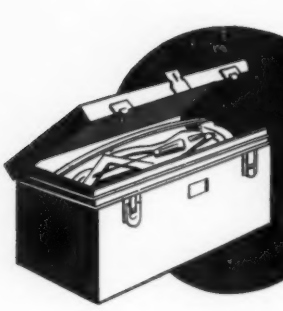
McCord's approach to this matter of accurate delivery of such small quantities is their differential plunger pump. The plunger has two diameters, 1/4-in and 5/16-in, and



Sectional drawing of McCord differential-plunger mechanical lubricator. Bobber replaces wire and liquid in sight-feed glass.

the shoulder does the actual pumping. Its area is the equivalent to a plunger of 3/16-in diameter. This design permits a longer, better-controlled stroke for a given displacement. On the other hand, the larger diameters allow a closer and more uniform lapped fit between the plunger and cylinder than would be the case with a smaller plunger. This design also has inherent qualities of being able to dispel minute amounts of oil-entrained air past the upper end of the plunger during normal operation.

The pump and bobber combination has worked out well for some time now. Accuracy of calibration is reported to be very good. In addition, and despite the fact that the sight glass is continually full of lubricating oil, it is further reported that visibility of the indicating device is excellent.



Straight from the Tool Box

This is YOUR Department. Pass along your ideas to the other fellow. Send items to the Editor, preferably with a picture or sketch. Contributors will receive $10.00 for each item upon publication.

Starting Aid Stops Knocking

FREDERICK G. HEHR, SANTA MONICA, CALIF.—Here is a tip from the tool box that may help many a poor cat skinner or similar high-speed diesel jockey. We all know that starting the beasties in really cold weather has its troubles such as refusal to fire and above all, dangerous knocking. In the early days, we at times encountered engines that literally knocked their heads off while starting cold.

Firing may be assured if you can raise the compression pressure and/or throttle the air intake. Or you can preheat the air. You may get a start, but the knocking remains until you get up to temperature. It's fairly easy to get rid of all knocking at the start. All that it needs is a small extra tank and a means of switching the fuel supply lines to it. Put in a mixture of one-quarter diesel fuel and three-quarters "regular" gasoline. White gasoline is even better. The diesel fuel assures lubrication for the pumps and nozzles.

When shutting down the engine, switch to the mixture and let the engine idle for about five minutes to clean out the straight fuel in the pumps first. When starting, use the mixture and let the engine run long enough to warm up and start to purr. Then switch to regular fuel. The way that this mixture does away with knocking is often startling. Even at 20 to 1 compression ratios, I've had it completely disappear.

This stunt was discovered accidentally one day when I ran out of fuel oil. I had some engines that were started from a safe distance on cold mornings. I used some plain gasoline with some lube oil mixed in and the engines started perfectly without the slightest knock. Right then, starting on a gasoline-fuel oil mixture became standard practice with that company.

This is no stunt and has a sound engineering basis. As a matter of fact, Messrs. McLaughlin, Pinotti and Sigworth of the California Research Corporation delivered an SAE paper entitled "Power Booster Fuels for Diesels" (DIESEL POWER, *January*, 1953), *which although not dealing specifically with starting problems, showed that the presence of high-volatility fuels could improve the combustion phenomena. Commercial starting aids commonly use highly volatile compounds, squirted into the intake air to help initiate combustion.*

Most starting knocks result from increased ignition delay due to cold oil, cold combustion chamber, and perhaps poorer atomization. Fuel continues to be delivered while the fire is starting, so that there is quite a lot present by the time combustion starts. It goes off with a bang. The more volatile gasoline (raising the cetane rating) promotes faster combustion and produces a smoother pressure rise. Watch it, though, you may have to play around with the mixture proportions. If the ignition lag is reduced too much or if the mixture used after the engine warms up, you could run into pre-ignition knocking—Editor

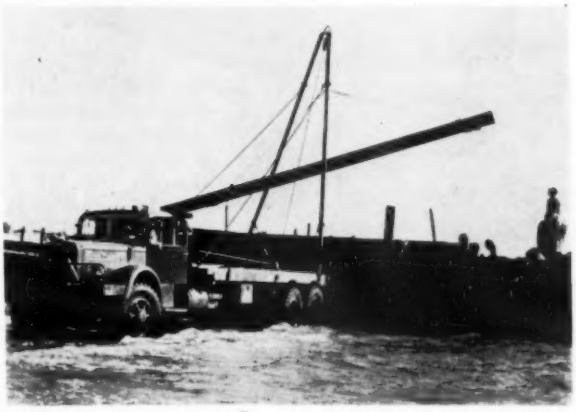
Tip on Cummins Injector Installations

WILLIAM C. BLACK, TUCSON, ARIZONA—Here is an idea that I use myself and find that it always works. It is a way to make installation of inlet and drain tubes on Cummins injectors easier.

Get an extra drain tube and strip it down to the bare tube. Set the injector in the cylinder head and tighten the two hold-down nuts with your fingers. Install the bare tube in the injector and shift the assembly around to center the tube in the hole in the head. Holding the tube centered, use a torque wrench to set the injector, torquing to the proper tension. When this is done, you can remove the drain tube used as a guide and install the regular inlet and drain tubes with no alignment difficulties. This eliminates the chance of cross-threading and damaging either the tubes or the injector. It can also save you a lot of time and grief.

This appears to be one of those simple, practical ideas that should be a real time and cost saver. Guide pins, simple jigs and fixtures always pay off.—Editor

news of our industry



Diesels Down Under

On December 4, 1953, oil fever gripped Australia as news of the sensational strike at Exmouth Gulf was flashed around the world. The word "oil" has brought dreams of new wealth for Australia—revived memories of the development and prosperity which accompanied the gold rush days 100 years ago.

Interest, for the present, is focused on the "Rough Range", where The Texas Company and Ampol of Australia have been wild-catting. The discovery well, which struck oil between 2605 and 3260 ft, has since been taken deeper for further exploration.

Behind the story of this strike are months of planning and arduous work under extremely difficult conditions. The location of the field itself, on the remote shores of Exmouth Gulf, 700 miles north of Perth, presented initial transportation problems, unique in oilfield hauling. Every piece of equipment had to be brought by landing barge to a beachhead and put ashore in a manner reminiscent of World War II invasion operations.

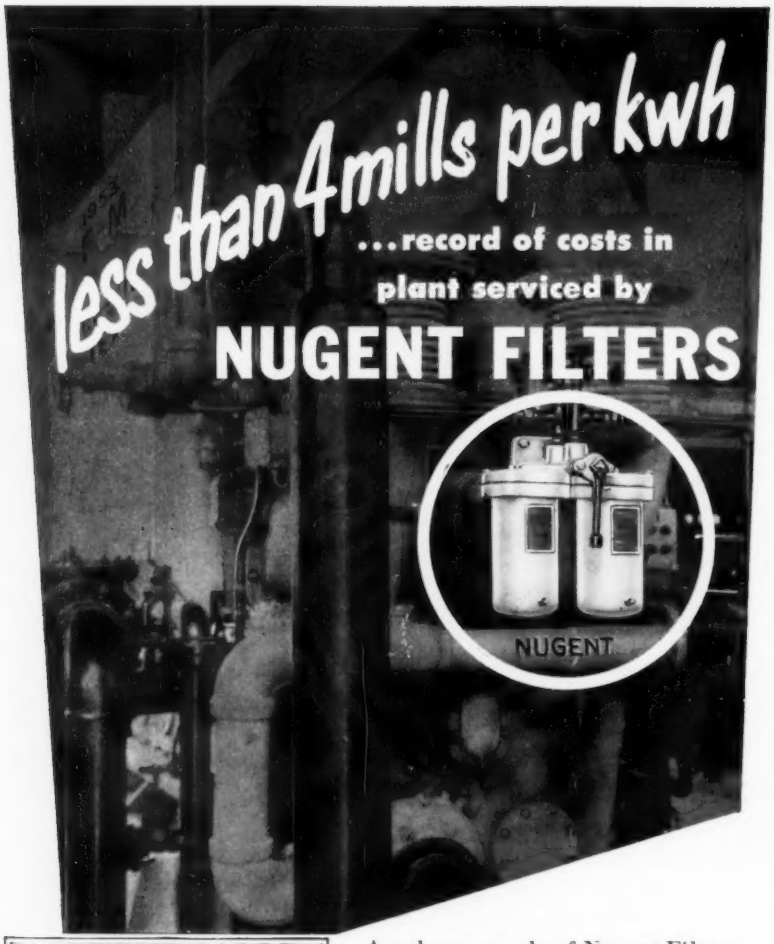
Upon two Mack off-highway oilfield trucks fell the task of transporting the massive machinery from beach to actual drilling site. Powerful 6-wheel vehicles with 200-hp diesel engines, these Macks were especially designed and equipped for oilfield work. These two trucks are the very first of many that must follow, for transportation is the key which will unlock the gate to large-scale production of the western Australian oilfields.

Roads will come and trucks will help build them. Then over these roads, through the lonely outback areas where only sun-dried spinifex and stunted scrub grow, the trucks will shuttle, bringing equipment and food and carrying back the oil that caused it all.

new products . . . . . page 116

new literature . . . . . page 120

organizational news . . . . . page 122



Nugent 11165V Duplex Fuel filter of the type installed at the power plant in Teague, Texas.

Another example of Nugent Filters operating as members of an "efficiency team" is at this city-owned power plant in Teague, Texas. Here, a 960 HP Fairbanks-Morse dual-fuel engine equipped with a Nugent 1116SV Duplex Fuel Oil Filter turns out over 3,000,000 KW annually at a cost of less than .004 per KW hour.

Nugent fuel oil filtering of this type, by actual test, removes 99.8% of harmful impurities—particles as small as a few microns that might otherwise block the fuel injector or accelerate wear.

Whatever your filtering requirements—fuel, lube oil or coolants—there's always a Nugent filter available . . . at low cost . . . of proper size and type. Write for full details on how Nugent filters can improve the efficiency of your operations . . . why it is factory installed on so many leading diesel engines.

NUGENT TRADE MARK

Wm. W. Nugent & Co., Inc.

417 N. Hermitage Ave. CHICAGO 22, ILLINOIS

Established 1897

OIL FILTERS, OILING AND FILTERING SYSTEMS, TELESCOPIC OILERS, OILING DEVICES, SIGHT FEED VALVES, FLOW INDICATORS

Representatives in Boston • Cincinnati • Detroit • Houston • La Junta, Colo. • Los Angeles • Minneapolis • New Orleans • New York • Philadelphia • Portland, Ore. • San Francisco • Seattle • St. Louis • Tulsa • Representatives in Canada: Montreal • Toronto • Vancouver

news of our industry

Santa Fe all Diesel

Santa Fe Railway announces that it is now completely dieselized, making it the largest railroad in the nation with a completely dieselized operation.

First diesel on its road was a 600-hp switcher which went into service in the Chicago yards in 1935. In the same year, the first passenger diesel (two units totaling 3600 hp) was tested and went into service in 1936 between Chicago and Los Angeles. Today, passenger diesels for the most part are three and four multiple units aggregating 6000 hp.

In 1940 the railway placed in service a 4-unit 5400-hp diesel freight and began replacing steamers with diesels for this operation. Eighty of these locomotives were owned by 1945, claimed to be the world's largest fleet of diesels.

The road now owns 977 diesel locomotives for a total of 1622 units and 2,263,210 hp. Included in this engine fleet are 90 passenger locomotives adding up to 245 units, 552 freight locomotives for 1040 units, and 335 switching locomotives totaling 337 units. An estimated 300 million miles are said to have been operated on the system since 1935 when diesels were introduced.

Ohio Municipals Up Capacities

The towns of Stryker and Waterville, Ohio announce that they have obtained the services of Carl J. Simon & Associates, consulting engineers, for additions to their power generating plants.

Reason for the additional installation at Waterville is increased load requirements and need of a sufficient standby. Plans call for approximately a 1000-hp unit. Present installations include one Superior 8-cyl engine of 615 hp and three Fairbanks-Morse engines, one 2-cyl model of 180 hp and two 4-cyl models of 240 and 300 hp. Engineer's report should be available about April 1st.

Stryker is planning to receive bids on a dual-fuel engine, capacity range between 600 and 700 kwh. Specifications have not as yet been printed.

news of our industry

Sewage Treatment in Miami

Five Worthington engines have been ordered for the new 24 million dollar sewage treatment plant in Miami, Fla., to help keep the beaches free from contamination. One of the engines, a 7-cyl, dual-fuel, 480-hp model, will drive an Electric Machinery Mfg. Co. generator to supply electric power to the plant.

Four 6-cyl, 410-hp, engines will drive the blowers which activate the sewage sludge beds. Two of these will be dual-fuel and two will be straight gas spark ignition engines, all operating at 514 rpm. The engines will be fueled by gas generated from the digested sludge after aeration by the engine-driven blowers. For varying conditions, the dual-fuel arrangement will permit changing over from gas to oil or combinations of the two fuels.

To Study Army Constructions

A 6-man team of government and industry experts is starting a tour of three United States defense bases to study maintenance problems on construction equipment controlled by the Army's East Ocean Div. The team will visit bases now under construction at Goose Bay, Labrador; Stephenville, Newfoundland; and Lajes, Azores.

John J. De Risio, chief of the Army division's equipment branch will lead the group. Others include Neil Harrington, Engineer's Atlantic District; Bruce Smith, Caterpillar Tractor Co.; James P. Kay, Euclid Road Machinery Co.; Ralph M. Holder, Barber-Greene Co.; and James H. Rucker, LeTourneau-Westinghouse Co.

Diesel Training Course

Greer Technical Institute, 2230 S. Michigan Ave., Chicago, Ill., announces that it has instituted a new 2-year college-level course in diesel and automotive engineering. The program is open only to high school graduates and is approved for veterans. Classes include 96 semester hours and terms open every March and September.

At the new Bradley Field airport in Connecticut, reliable emergency power is vital . . . the right battery for starting the emergency Diesel equally vital. This installation uses Nicad. System operates field lights, control tower, INSAC station, instrument landing system.

Airport Emergency Lighting

. . . that's a starting job for NICAD

The 375 h.p. Diesel emergency lighting system which protects this airport is started by a Nicad battery.

Field lights and control tower would stay in darkness were the battery to fail in its job. But the Nicad's characteristics are positive . . . custom-groomed to the service. Like its European ancestors, this nickel cadmium battery is protected against self-deterioration and outside damage. Its cells are steel, inside and out, its alkaline electrolyte a preservative of steel.

In addition to its great reliability are the vital services it offers and lowest over-all cost. Want to investigate? Send coupon for data.

NICAD

The Battery with the Steel Constitution

Send this coupon for information on Nicad

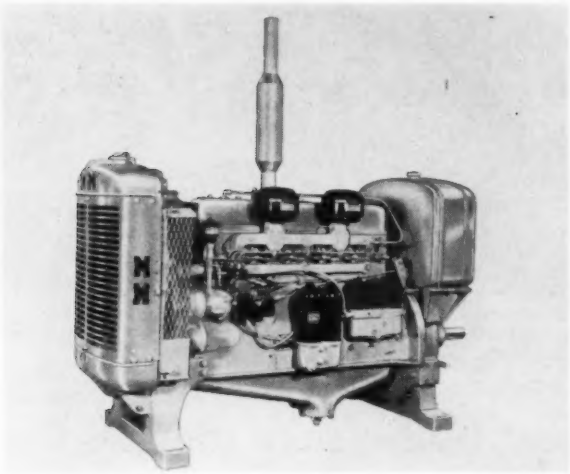
NICKEL CADMIUM BATTERY CORPORATION
Box 511, Easthampton, Mass.

Please send me authoritative data on Nicad batteries. We are interested in the fields checked below.

☐ Signal Service ☐ Stationary Diesel Starting ☐ Diesel Switcher Starting
☐ Telephone Service ☐ Switchgear Operation ☐ Crossing Gates
☐ Track Circuits ☐ Car Retarding ☐ Emergency Light and Power

Name .....
Function .....
Company .....
No. and St. .....
City ..... Zone ..... State .....

new products



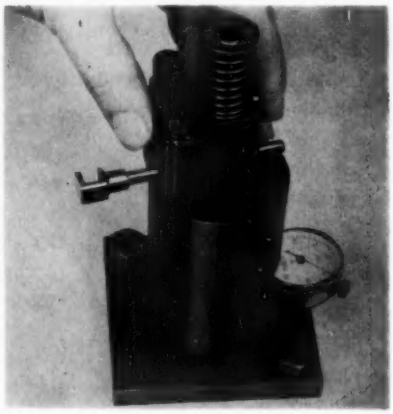
POWER UNITS

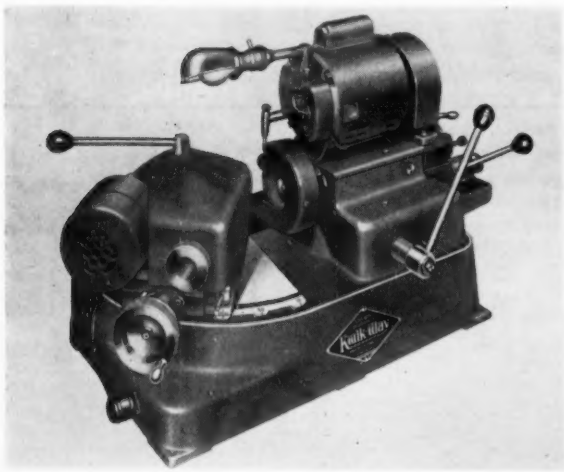
Production of two industrial power units has been announced by the Minneapolis-Moline Company, Minneapolis, Minnesota. According to the announcement, the latest developments have been incorporated into the design of the new units. Both the Model D283-4 and the Model D425-6, 4- and 6-cyl units respectively, have a bore and stroke of 4¼ in by 5 in and feature energy cell combustion.

Other factors, said to contribute to lower maintenance are the Bosch PSB fuel injection pump, an improved package water pump, and two water coolant nozzles for each fuel injector nozzle. Heavy-duty, cam-ground aluminum pistons, liberal size of crankshaft journals, and large bearing areas are designed to supply an extra margin of dependability for continuous, heavy-load operation.

Injector Tip Concentricity Gauge

To check concentricity between injector tip and injector nut after assembly, a special gauge has recently been added to Kent-Moore's line of diesel service tools. The "run-out" of the injector spray tip may be measured by simply placing the assembled injector in the gauge, then setting the dial indicator at zero, and rotating the injector in a complete circle and noting the total reading. If total indicator reading is greater than 0.008 in, spray tip should be re-centered and checked again. Details available from Kent-Moore Organization, Inc., 5-105 GM Building, Detroit, Michigan.





Valve Facing Machine

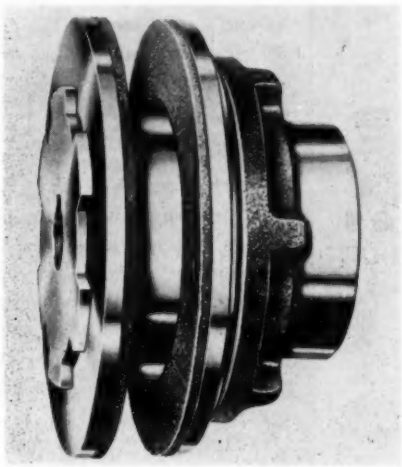
Manufacture of a new valve facing machine with a standard chuck capacity ranging from 7/32 in to 5/8 in has been announced by the Cedar Rapids Engineering Company, Cedar Rapids, Iowa. According to the company, the "Kwik-Way Super Matic" as it is called, is especially designed for extreme accuracy, superior finish and smooth, easy operation.

In addition to the 1/3-hp grinder spindle and coolant pump motor, a 1/12-hp motor drives the chuck. Microswitch control of various operations is also featured. The instant the grinder spindle carriage is moved toward the work, the grinder spindle, chuck spindle, and coolant pump start automatically. The coolant pump is submerged in the coolant, thus eliminating priming and leakage problems.

Torque Limiters

A line of slip-clutch overload protection devices has been introduced by the Morse Chain Company. Called, Torque Limiters, the compact, adjustable friction-clutch devices are adaptable to a wide variety of machine drives. Featured in the device is a powdered metal bushing on which such drive components as chain sprockets, V-belt pulleys or gears can be mounted. Eleven standard models giving maximum torque capacities from 20 to 620 ft-lb can be had.

The torque limiters have been designed to act as automatic shear pin mechanisms that avoid the time and labor necessary to insert new shear pins. These devices consist basically of a driving or driven member combined with a spring loaded friction clutch that can be adjusted to slip when the desired torque is exceeded. They consist of a low carbon steel threaded and splined hub, two steel plates, two unbonded clutch facings, a powdered metal bushing, a Belleville spring, and a steel or cast iron adjusting nut. The clutch plates slide on six SAE angular straight-sided splines.

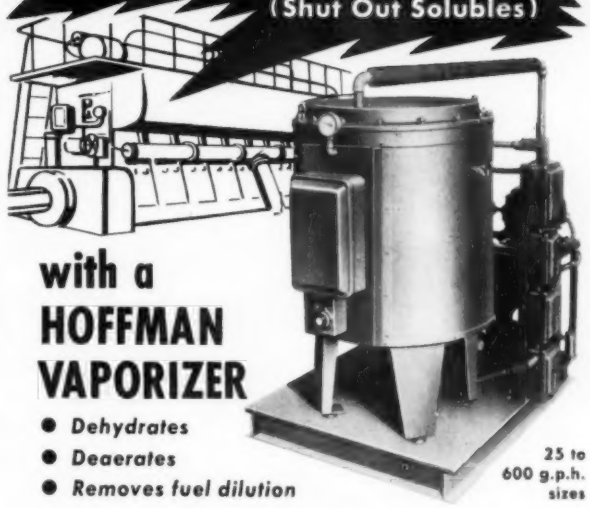


The driven member (a sprocket, sheave or gear) is mounted on the bushing and clamped between the clutch facings by the Belleville spring. The hub is bored to fit standard motor shafts and is held in position by a set screw.

When the torque capacity of a Torque-Limiter is exceeded, the driven member breaks away from the clutch facings. It then slips at from 1/3 to 1/2 the torque setting. Thus, when an overload condition occurs in a machine drive, with a Torque-Limiter, the components resist only from 1/3 to 1/2 the motor torque until the motor is shut off and the condition corrected.

Noisemaker devices can be incorporated into the clutch designs where drives are remote from the machine or equipment operator. After a drive overload condition is corrected, a drive with a Torque-Limiter can be started up instantly without incurring any maintenance time or expense.

Answer your engines' S.O.S.
(Shut Out Solubles)



with a HOFFMAN VAPORIZER

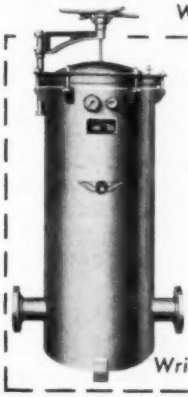
- *Dehydrates*
- *Deaerates*
- *Removes fuel dilution*

25 to 600 g.p.h. sizes

Filters that remove just solids give your engines only partial protection. Soluble impurities such as water, fuel dilution, air and gas, remain to damage walls and bearing surfaces.

The Hoffman Vaporizer, which uses two of the most effective means known, heat and vacuum, to drive off solubles from lube oils, can be operated either independently or as an adjunct to your existing filtration equipment. Automatic, easy to clean, it soon pays for itself in savings on maintenance and replacement of expensive engine parts.

Write for Bulletin A-840



HOFFMAN cartridge filters

Full-flow "Flomaster"—Removes particles from 20 down to 5 microns. 25 to 900 g.p.m. models. Also 11 x 18 or Navy-size 7 x 18 cartridges for by-pass or shunt operation. For use with Fuller's earth, cellulose or waste. Wide range of sizes in both types.

Write for Bulletins A-649, A-888, A-952

HOFFMAN oil conditioner

Completely restores lube oils in one automatic operation. Combines a Hoffman Cartridge Filter and a Vaporizer into a single compact unit. Portable and stationary models. 25 to 600 g.p.h. standard models with larger sizes available as special units.

Write for Bulletin A-974

Hoffman
INDUSTRIAL FILTRATION EQUIPMENT & SERVICE
U. S. HOFFMAN MACHINERY CORP., 251 LAMSON STREET, SYRACUSE 6, N. Y.
In Canada: Canadian Hoffman Machinery Co., Ltd., Newmarket, Ont.

JOHNSON
ALUMINUM-ON-STEEL BEARINGS

■ Improved diesel design is somewhat dependent on improved bearings and other component parts. Here is a new type sleeve bearing which was developed for the new engines . . . for heavy duty service, for higher loads and high speeds . . . Aluminum-on-Steel. The properties of aluminum, bonded to steel, permit loads up to 5000 P.S.I. They have excellent corrosion and fatigue resistance, good resistance to shaft wear, good conformability and imbeddability, and adequate seizure resistance. Leading diesel builders have thousands of engines in service today equipped with them. Investigate.
JOHNSON BRONZE CO., 470 S. Mill St., New Castle, Pa.

new products

Plate Heat Exchanger

The De Laval Separator Co., Poughkeepsie, N. Y., announces a new plate heat exchanger which, it states, is adaptable to virtually unlimited industrial process applications.

The plates, pressed from extra-heavy stainless steel stock and containing deeply corrugated surfaces, are said to resist distortion and have been made to withstand higher than average operating pressures. Because of this corrugated design, high velocity and turbulence of the liquid result and the heat transmission coefficient is high.

The plates are invertible and thus the exchanger may be altered to adapt it to changes in operation. Inlet and outlet parts in the plates can be varied without the use of new or extra plates. A wide range of sizes, models, and capacities of the exchangers are available.

Impact Wrench Stud Driver

A new stud driver designed for rugged use with an impact wrench for motive power, has been announced by The Titan Tool Co., Main St., Fairview, Pa. The tool is equipped with a loose pressure plunger for easy release after stud is driven.

Stud diameters from ¼-in to 3-in are accommodated; female driving squares from ½-in to 1½-in. Morse taper and hex slip chucks are available to adapt the tool for other motive power. The tool is said to be especially useful in locomotive shops and plants which build heavy equipment.

Spark-Resistant Chain Hoist

A one-ton non-magnetic, spark-resistant chain hoist for use where standard hoists of ferrous materials have proved unsuitable, has been developed by Ampco Metal, Inc., 1745 S. 38 St., Milwaukee 46, Wis. It is recommended for use in hazardous areas where a spark might cause explosion and where corrosion might result from direct contact with liquid or fumes.

new products

Pressure Monitor

Control Engineering Corp., Norwood, Mass., has a new pressure monitor designed to give accurate, calibrated readings of any dynamic pressure, and which can be used with any 2- or 4-arm strain gauge transducer and standard oscilloscope.

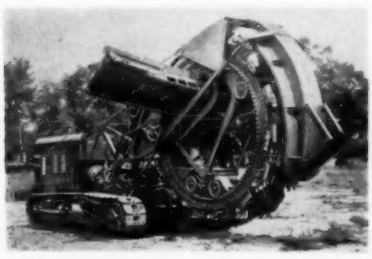
If sensitivity of transducer being used is known in terms of microvolts per volt per psi, the monitor calibration system can be utilized to indicate pressures in psi without need for other calibration procedure. The calibration circuit allows static as well as rapidly fluctuating pressures to be measured.

The instrument contains a plug-in, 2-stage amplifier with a self-contained DC bridge power supply, eliminating power frequency interference. Shock-mounting is said to reduce microphonics to a negligible level.

Pipeline Ditcher

Gar Wood Industries, Inc., Wayne, Mich., announces a new heavy-duty, wheel-type ditcher, Buckeye Model 315, designed to dig to a maximum depth of 6 ft, with widths of cut from 24-in to 40-in in steps of 2-in. It has eight digging speeds forward from 1.37 to 20.49 fpm.

Powering the ditcher is a heavy-duty diesel of 76 hp at 1600 rpm. Two types of clutches are available, fluid coupling in conjunction with over-center friction clutch or heavy-duty single-plate toggle-type clutch, both by Twin Disc. The wheel comes equipped with 15 standard buckets bolted on 1-piece digging rims which are drilled so that various numbers of buckets can be used. There are six conveyor speeds from 225 to 764 fpm.



Safeguard costly overhaul jobs...use

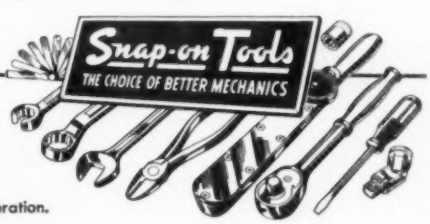
Snap-on* TORQOMETERS

wherever bolt tension is specified!

Photograph used through the courtesy of H. O. Penn Machinery Company, Inc.

● Inaccurate bolt tensioning means mechanical distortion—excessive wear of critical parts—and frequently, outright failure. *Snap-on Torqometers guard against costly come-backs!* For hairline accuracy, readings on the big dial are amplified nearly 500 times. The mechanic *sees* the applied torque hit the exact pressure specified by the manufacturer. He works confidently and swiftly. Readings are *always* dependable. Torqometer design eliminates friction drag. Accuracy is never affected by the way the tool is held.

Snap-on Torqometers are built in 15 standard models, capacity from 0 to 30-inch pounds, up to 2,000 foot-pounds. (Up to 4,000 foot-pounds on special order.) Direct service from Snap-on factory branch warehouses in 43 industrial centers. Write for Snap-on Industrial Catalog and general catalog of 4000 Snap-on hand and bench tools today.



SNAP-ON TOOLS CORPORATION

8064-D 28th Avenue, Kenosha, Wisconsin

*Snap-on is the trademark of Snap-on Tools Corporation.

new literature

Pipe Insulation Standards

Producers of 85 per cent magnesia and diatomaceous silica insulations have adopted new simplified thicknesses for pipe insulation to aid specification writing and permit the use of all sizes and thicknesses in double layer construction.

The new thickness table results from the collaborative efforts of the members of the technical committee of the Magnesia Insulation Manufacturers Assn., 1317 F St., N. W., Washington 4, D.C. In effect a "standardization" procedure, under the new system all magnesia and diatomaceous silica pipe insulations will conform to the new table. A complete conversion table covering all insulation thicknesses for all pipe sizes may be obtained from the association.

V-Belt Slide Films

Allis-Chalmers Mfg. Co., General Machinery Div., Milwaukee 1, Wisc., has issued the second group in its series of educational 35-mm sound slide films for industry. The three new films are on the subject of V-belt drives, each running about 20 min.

The first, "In Every V-belt Drive", covers the engineering principles. "For Better Driving", the second, concerns installation and maintenance of multiple drives. "Selecting a Drive" tells how to check characteristics to find the best type of drive and then engineer it to do the job. They are prepared for such audiences as industrial maintenance men, plant and design engineers, and engineering students, and make use of drawings, humor and step-by-step photographs to get their points across.

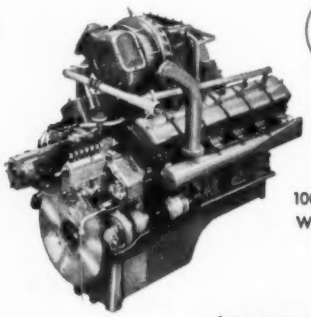
Points on Pyrometry

For temperature measurement beyond 1000°F, a thermoelectric pyrometer is the most economical device giving precision results, according to a new bulletin entitled "Temperature Indications", released by Illinois Testing Laboratories, Inc., 420 N. LaSalle St., Chicago 10, Ill. The bulletin offers concise discussion of pertinent facts about pyrometry in general industry.

For example, did you know that a pyrometer is essentially a small DC motor with restraining springs instead of a commutator? It registers the small amount of thermoelectricity generated when the thermocouple is exposed to heat, translating current flow into temperature readings. The bulletin discusses the advantages of this instrument over other temperature indicators and describes the full line of Alnor pyrometers available from the company for different temperature-reading problems.

LOWEST Weight—Size—Horsepower Ratio ever offered in a diesel!

the new, highpowered **MERCEDES-BENZ**

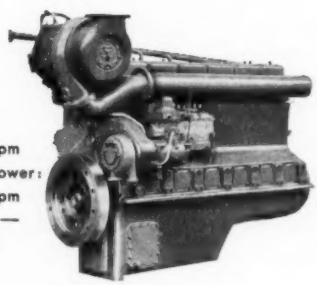


MB 820B
Supercharged
12 cylinders
1000 H.P. — 1500 rpm
Weight: 5622 lbs. —
(without clutch)

Note these exclusive features:

- **WEIGHT-SIZE-HORSEPOWER RATIO** less than that of any other diesel engine
- **PRE-COMBUSTION CHAMBER** — consumes less fuel, assures cleaner engine
- **4-CYCLE ENGINE** — less wear than a 2-cycle engine
- **COUNTER-BALANCED CRANKSHAFT** assures unusual smoothness and quiet during operation
- **MERCEDES-BENZ COSTS LESS** than other engines of comparable power and quality

Mercedes-Benz high quality Diesels are available in a wide range of engine types — from 10 H.P. to 2500 H.P.

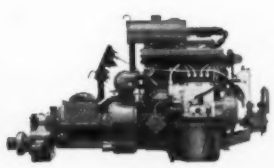


MB 836
6 cylinders
315 H.P. — 1500 rpm
With supercharged blower:
500 H.P. — 1500 rpm
Weight: 4081 lbs. —
(without clutch)

Mercedes-Benz Diesel Engines are on display in the showroom of our U.S. distributors — where parts and service are also obtainable.

Customers and dealers are invited to visit or write:

EUROPA MOTORS BUILDING
341 East 62nd Street, New York 21, N.Y.
Phone: TEmpleton 8-8388



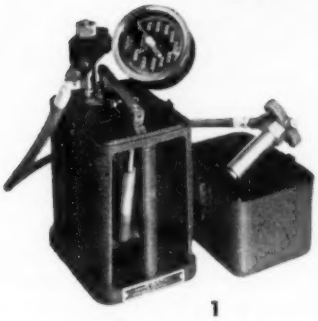
OM 636
30 H.P. — 2500 rpm
Length: 2 ft. 8⅛ in.
Width: 1 ft. 10 1/16 in.
Height: 2 ft. 8 15/16 in.
Weight: 350 lbs. —
(without clutch)

Manufactured by:

DAIMLER-BENZ, A.G.

Europe's most famous manufacturers of precision automotive, marine and industrial engines.

KIENE® diesel engine test equipment



1. Model KTP-50, Hydraulic Test Pump . . . designed for field service . . . portable . . . no bolts or clamps for leverage . . . many novel features.
2. Model K-120, Universal Indicator . . . for high-speed automotive type diesels . . . can be adapted to larger engines for firing pressure readings.
3. Model V-10, Indicator Valve . . . rugged . . . will not blow open . . . adaptions for all locomotives.
4. Model K-100, Cylinder Pressure Indicator . . . simple . . . accurate . . . for compression and firing pressures on large horsepower engines.

Kiene Adapters and Connectors available for all makes and models of diesel engines manufactured in U.S.A.

Kiene Diesel Engine Test Instruments are recognized throughout the industry for their accuracy and adaptability. They are designed for long service under most severe field conditions. Kiene equipment assures the proper maintenance of diesel engines . . . helps prevent costly down time. Get the facts on Kiene before you invest in diesel test equipment.

Send for Descriptive Literature

KIENE DIESEL ACCESSORIES, INC.
BOX 216, FRANKLIN PARK, ILLINOIS

new literature

Electric Energy Production

The Federal Power Commission, Washington 25, D. C., has just released its publication "Production of Electric Energy and Capacity of Generating Plants, 1952". Data is based on monthly reports and coverage comprises some 3698 generating plants operated by 1395 electric utilities, privately and publicly owned.

Internal combustion plants show an increase of 1.8 per cent over 1951 with an kwhr record output of 3,736,315,000. This represents an increase of 65,760,000 kwhr over 1951 as compared to a rise of 10,895,000 kwhr in 1951's total over 1950.

The report lists production by areas with comparative 1951 data. Installed capacity by years is also listed, along with 1951 comparative data in areas. Gross capacity increase in 1952, resulting largely from installation of new equipment, was 150,462 kw for internal combustion plants. Capacity for 1952 of industrial establishments was 1,147,578 kw. For combined utility and industrial, the total was 3,276,176 kw.

A breakdown listing of plants with internal combustion as the prime mover for 1952 is given as follows:

	No. of Plants	*Kilowatt Capacity*
All Classes	1256	2,128,598
Private Utilities	452	629,061
Municipals	650	1,168,088
Federal Projects	10	13,542
Coops, Power Dists. and State Projects..	144	317,907

Electronic Balancing Machine

The Electodyne, a new machine for automatically measuring the amount and indicating the angular location of unbalance by means of electronics, is described in a bulletin released by Tinius Olsen Testing Machine Co., 3024 Easton Rd., Willow Grove, Pa. Also featured in the bulletin is the complete line of the company's dynamic and static balancing machines, operating on this principle, including the automatic crankshaft balancer.

Diesel "Power Parade"

The important role diesel power plays in the world's economy is told in the spring issue of "Power Parade", a booklet issued quarterly by the Detroit Diesel Engine Div. of General Motors Corp., 13400 W. Outer Dr., Detroit 28, Mich. Industries covered include marine, agriculture, mining, logging, railroad, and petroleum. Also contained is a discussion of proper cooling system maintenance.

Data On Pipe and Fin Coils

Rempe Co., 340 N. Sacramento Blvd., Chicago 12, Ill., has published the second edition of its engineering data book presenting engineering, design, and calculation data on heating and cooling surfaces for use on applications of pipe and fin coils.

The 34-page book is fully illustrated and is designed to provide answers to engineering, design, and heat transfer problems. It will be sent without charge to anyone requesting a copy on company letterhead.

organizational news

Diesel Engineer Retires

Hugo H. Haas, civilian head engineer of the Navy's Bureau of Ships, has announced his retirement from that service to open a consulting office.

Mr. Haas has a background of 48 years in the diesel industry. Educated in Switzerland, he was connected with several firms in that country and England before his entrance into United States' industry in 1916. He joined the Army Engineers in 1923. During the war, he took over the internal combustion engine section for the Navy at the Bureau of Ships. Among his top achievements have been the designing of river towboats, self-propelled pipeline dredges, and seagoing hopper dredges.

C. Lee Cook Sales Promotion

The appointment of John E. Scoggan as assistant sales manager has been announced by C. Lee Cook Mfg. Co.

Mr. Scoggan was formerly in the company's engineering and production departments. Prior to his affiliation with the organization, he was with Curtiss Wright Co. as a blade design engineer.

John E. Scoggan

Worthington European Manager

The appointment of B. R. McBath as general European manager has been announced by Worthington Corp. He will headquarter at the French-Worthington Co., in Paris.

Mr. McBath first joined the corporation in 1928 and served for 20 years in charge of various engineering activities and as chief engineer of the research and development department. He was Plainfield works manager when he left in 1949 to serve as vice president of the U.S. Hoffman Mfg. Corp. In 1953, he returned to the organization as assistant to the vice president in charge of manufacturing and before his present appointment was acting manager of the new Decatur, Ala. plant.

• ST. LOUIS, MISSOURI • CHICAGO, ILLINOIS • NEW ORLEANS, LOUISIANA • BALTIMORE, MARYLAND •

MOBILE, ALABAMA • SAN DIEGO, SAN FRANCISCO, SAN PEDRO, CALIFORNIA

NORFOLK, VIRGINIA • SEATTLE, WASHINGTON • VANCOUVER, BRITISH COLUMBIA

OSWALD MACHINE WORKS . . . *offers complete parts and service for*

S-N MARINE GEARS

No matter where you may be, from the Atlantic to the Pacific, you'll usually find an established S-N distributor ready to provide dependable parts and service. They, like hundreds of fleet and boat owners recognize from first hand experience the *reliability, outstanding performance* and *smooth power transmission* of these world famous Snow-Nabstedt Marine Gears. Remember . . . for S-N parts, see your engine distributor first. If he cannot offer immediate service, contact your nearest S-N distributor.

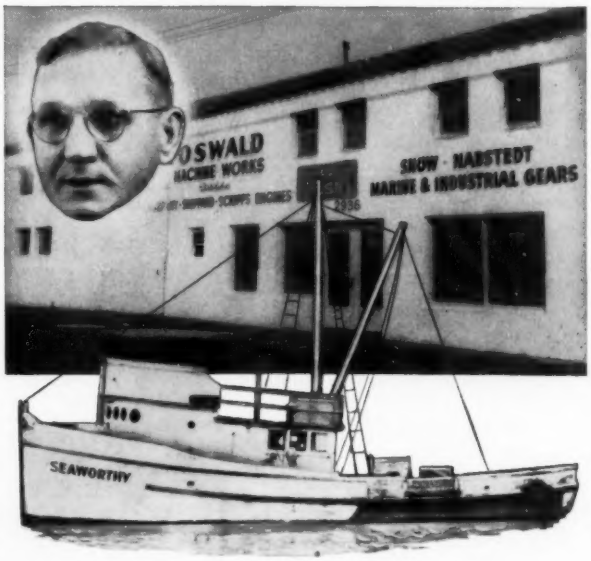
ON THE FINEST MARINE ENGINES 4 TO 1000 H.P.

SNOW-NABSTEDT

Transmission Engineers

FOR NEARLY HALF A CENTURY

THE SNOW-NABSTEDT GEAR CORP., HAMDEN, CONN.

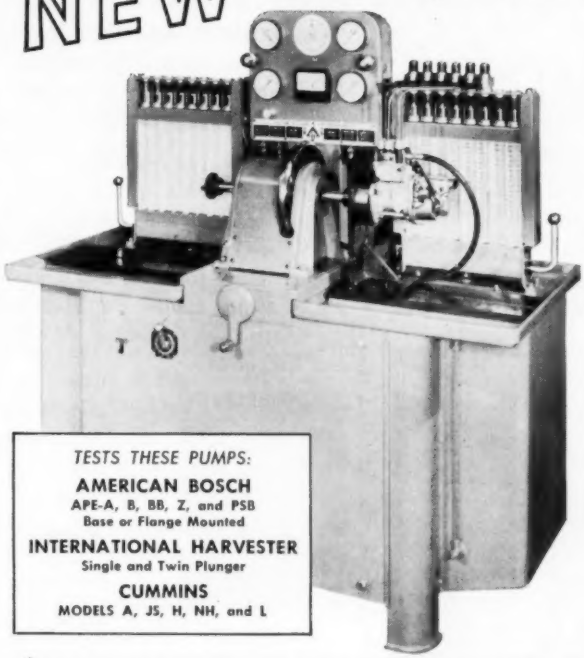


• *Charles Oswald,* • *Oswald Machine Works — 2936 Hyde Street, San Francisco, California* • *The "Sea Worthy" powered with Murphy Diesel Model ME-150, 150 H.P. S-N MARINE GEARS Model 3766, 3:1 ratio.*

• DETROIT, MICHIGAN • JACKSONVILLE, MIAMI, FLORIDA • PORTLAND, OREGON • HOUSTON, TEXAS •

NEW **Diesel Injection Pump CALIBRATING STAND**

Best for all pumps



TESTS THESE PUMPS:

AMERICAN BOSCH
APE-A, B, BB, Z, and PSB
Base or Flange Mounted

INTERNATIONAL HARVESTER
Single and Twin Plunger

CUMMINS
MODELS A, JS, H, NH, and L

Born out of more than four years of engineering work this Test Stand is unique for its versatility and convenience of use. Furnished with a full set of test nozzles, mounting brackets, fuel lines, coupling drives, etc. to test all commonly used makes of multiple-plunger and distributor types of fuel pumps, the stand incorporates everything the most exacting Diesel service expert wants in a pump calibrating stand, yet it is offered at a price which makes it a sound and profitable investment for any shop doing Diesel repair work.

By following the instruction manual which is furnished with each stand any mechanic qualified to repair or rebuild Diesel engines, can calibrate and adjust injection pumps to restore the original factory settings after rebuilding or repairs. Thus, many pumps which otherwise would have to be replaced, can be returned to service with complete assurance that they will operate to exact specifications for maximum engine efficiency.

WRITE FOR BULLETIN D661

BACHARACH INDUSTRIAL INSTRUMENT CO., 7301 PENN AVE., PITTSBURGH 8, PA.

Since 1909 Makers of Testing Instruments and Other Precision Devices

Telephone: MOntrose 1-0702

organizational news

Nordberg Names Two

The Heavy Machinery Div. of Nordberg Mfg. Co. announces two organizational changes to widen the scope of its activities. Carl O. Friend has been appointed administrative manager and H. W. Dow, Jr., has been named chief sales technician.

Mr. Friend joined the company in the Crusher Div. in 1941. He later served in the Coast Guard and returned to Nordberg in a business administrative capacity. In 1948, he was named manager of advertising, publicity, and sales promotion activities until he became manager, gasoline marine engine department, in 1950.

Mr. Dow began his career in 1936 as a test engineer for the General Electric Co. He joined Nordberg in 1943 as a production engineer and late in 1945 was named sales engineer. Two years later, he was appointed district manager, mideastern territory.

Briggs Sales Promotion

H. K. Woodward has been appointed to the position of general industrial sales manager for the Briggs Filtration Co.

To take the new assignment, Mr. Woodward leaves the post of manager of the northeastern and north central region, which he has occupied for the past six years. He has been connected with the company since 1945 in various sales, sales development, and research capacities.

Other organizational changes announced were the naming of John D. MacGuffin to managership of the north center region with headquarters in Chicago, and C. J. DeVries to manager of the southeastern region.

H. K. Woodward

J. D. MacGuffin

Montreal Publicity Director

David D. Frank has joined the Montreal Locomotive Works, Ltd. as director of public relations, in charge of all publicity and advertising.

Mr. Frank has been a member of the public relations department of the American Locomotive Co., United States affiliate, since 1949. As director of information, he had charge of all company publicity. Prior to that he was a reporter for the Wall Street Journal.

Michiana Has New President

Nathaniel E. Duval has been elected to the presidency of Michiana Products Corp., manufacturers of automotive and diesel equipment. He succeeds Otto M. Carry who is retiring after 25 years of service in that capacity.

Mr. Duval, former vice president and director of the Massachusetts Mohair Plush Co., Inc., first became associated with the company when he was elected to the board of directors three years ago.

organizational news

F. L. Humphrey, Jr.

G. C. Bayles

Elliott Sales Changes

Elliott Co. announces the opening of a new sales office in New Orleans to service southern Mississippi and Louisiana. G. C. Bayles, formerly of the Atlanta office, has been named manager. He joined the company's research and development department in 1945 and was transferred to application engineering in 1949. In 1953, he went to Atlanta as a sales engineer.

F. L. Humphrey Jr., was recently named assistant district manager in Atlanta. His association with the company dates from 1938 when he was assigned as a field engineer. In 1942, he entered the army and returned to Atlanta in 1946.

Maxim Silencer Manager

Paul G. Tomalin has been appointed head of The Maxim Silencer Co.'s new Washington office, with responsibility for sales and engineering of all the company's products in the District of Columbia, Maryland and Virginia.

Paul G. Tomalin

Mr. Tomalin's career has been in the field of marine engineering. For the last 10 years, he has been chief of the Machinery Technical Section of the United States Coast Guard, having joined that service in 1931 as assistant Naval architect. Previous to that, he had been with Luders Marine Construction Co. He has taught marine engineering and naval architecture at George Washington University and is a member of many engineering and marine societies.

Micro-Precision Moves

Manufacturing operations have begun at the new Evanston, Ill., plant of Micro-Precision, Inc. Management of the company will be under the direction of N. Fodor, executive vice president and general manager. Sales will be under F. J. Hoder, Jr., sales manager, and Alexander Dreisin will head the engineering department.

Formerly located in Chicago, the company known as the Diesel Engineering and Mfg. Corp. (Demco), became a subsidiary of Micromatic Hone Corp. in 1953. It specializes in diesel fuel injection equipment and hydraulic controls, and will continue its present line of products in this field with greater emphasis being placed on engineering and development of new hydraulic products.

Mounted on International Truck
Mounted on Cummins stationary engine
STANDARD OF THE INDUSTRY
Luber-finer
STANDARD AND OPTIONAL EQUIPMENT ON
AMERICA'S LEADING DIESEL TRUCKS
TRACTORS AND STATIONARY ENGINES
SINCE 1936
Luber-finer Model F-120 & F-155 Diesel Fuel Filters
Luber-finer Model 750-2 & 750-3 Industrial
ALLIS-CHALMERS HD20 DIESEL
and Remember!
only GENUINE
LUBER-FINER PACKS
with Exclusive Patented Process
• REDUCE ENGINE WEAR AND MAINTENANCE COSTS
• CLEAN MORE OIL FASTER • KEEP OIL CLEAN LONGER
FAR BEYOND THAT OF ANY ELEMENT AT ANY PRICE
Luber-finer Packs Available:
REFINING PACK. For use on straight Mineral Oil, Synthetic Oils, Diesel Fuel Oil, Hydraulic Fluids, etc.
DIESELPAK. Expressly designed and recommended for use with all detergent type compounded oils.
WRITE TODAY for complete information—see how you, too, can save many dollars and hours in maintenance.
GET THE FACTS FREE!
LUBER-FINER, INC., 2508 S. Grand Ave., Los Angeles 7

organizational news

Consolidated Diesel Expands

Consolidated Diesel Electric Corp., continuing its expansion program, has announced establishment of an aircraft equipment division. The move was made in anticipation of increased use of commercial jets which will require the same type of mobile-starting and servicing units now being built for military jet planes.

Gerald Rosenberg will be general manager of the new division, with Albert Sackler as chief electrical engineer and J. I. Davis as chief mechanical engineer.

The concern has specialized in the manufacture of diesel engines for the starting units, ranging from 15 to 200 kw. The company is now completing a contract for 636 units of 30 kw each, and 341 units of 100 kw each.

New AAF Vice President

The American Air Filter Co., Inc. announces the election of Howard M. Fitch, general manager of its Herman Nelson Div., to vice president.

Howard M. Fitch

Mr. Fitch joined the organization as a sales engineer in 1936. He served as production manager, manager of the legal and patent department, and assistant to the executive vice president, before becoming manager of the Nelson Div. in 1953. The development of the company's Cycoil oil-bath air cleaner used on large stationary diesel engines is attributed to him.

Aeroquip Advancements

Aeroquip Corp. announces the appointments of Joseph R. Roberts as advertising manager and Marvin W. Brandau as director of market development.

Mr. Roberts comes to the company from International Harvester where he has been supervisor of industrial power advertising and sales promotion. In his new post he will be responsible for all advertising and sales promotion activities of the company and its subsidiaries.

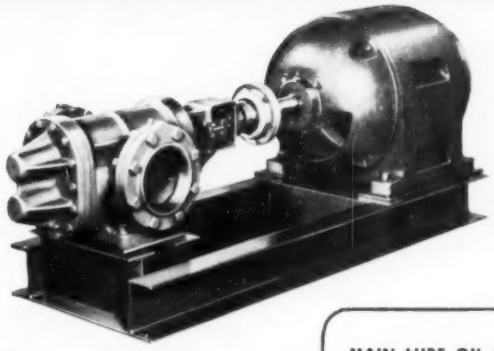
Mr. Brandau has been with Aeroquip since 1940 and has held various executive positions. He advances to his new position from the office of industrial sales manager where he has built up the company's current nation-wide distributor organization. He will now concentrate his efforts in developing new markets and finding new applications for the company's products. W. F. Rogge replaces him as industrial sales manager, having left Firestone Tire and Rubber to accept the position.

M. W. Brandau

J. R. Roberts

ROPER PUMPS

Complete Pumping Service for the Diesel Field

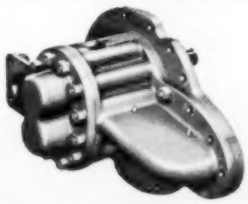


Series 3600 — 40 to 600 G.P.M. up to 60 P.S.I. Packed Box construction, hardened steel shafts, hardened alloy iron pumping gears. Heavy duty bronze bearings.

Series F — 1 to 300 G.P.M. up to 300 P.S.I. Packed Box or Mechanical Seal construction, hardened steel shafts, steel pumping gears, heavy duty flange type bronze bearings.

Series K — 1 to 50 G.P.M. up to 150 P.S.I. Packed Box or Mechanical Seal construction, hardened steel shafts, hardened steel pumping gears, heavy duty bronze bearings.

Custom — Adapting the Roper pumping principle to customer's requirements.



MAIN LUBE OIL PUMPS
Motor Driven
Engine Driven

STANDBY LUBE OIL
Before and After Pumps

FUEL SUPPLY PUMPS
Motor Driven
Engine Driven

AUXILIARY SERVICE PUMP
Fuel Transfer
Lube Oil Transfer
Hydraulic Power Control Pump

Write for catalog

GEO. D. ROPER CORPORATION
164 Blackhawk Park Ave., Rockford, Ill.

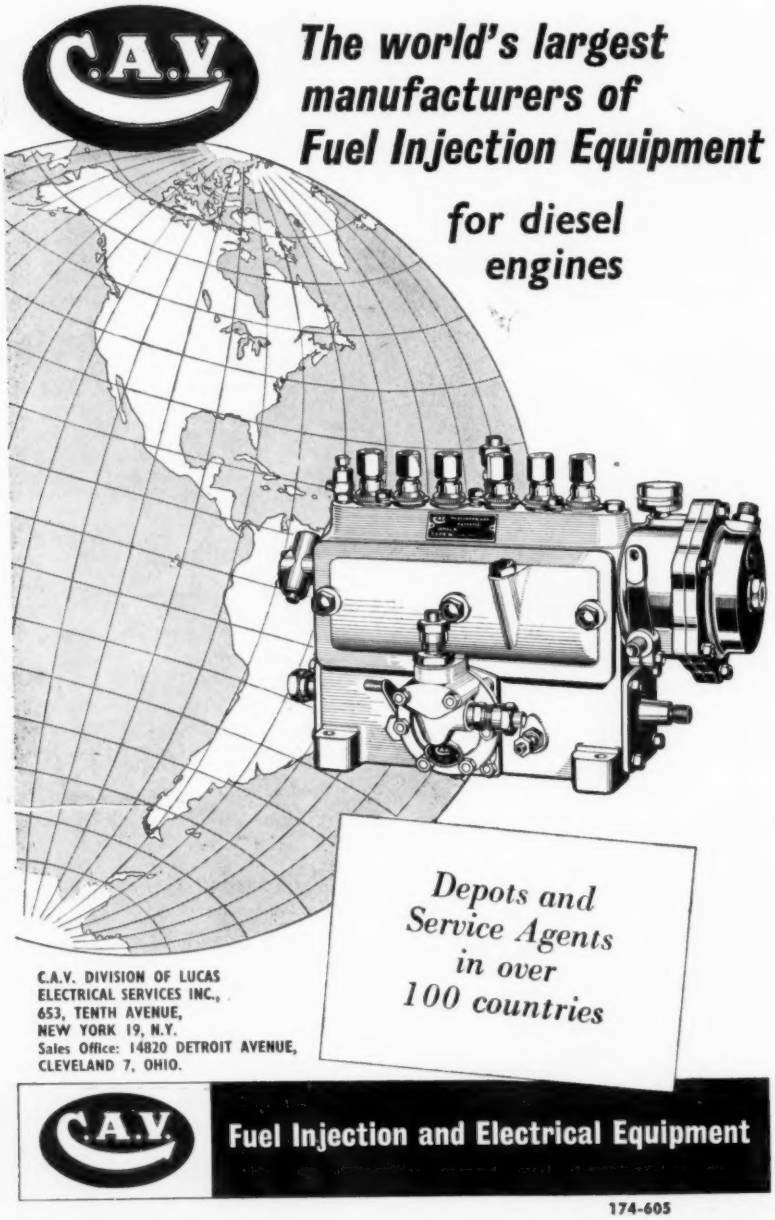
ROPER Rotary Pumps

news of our industry

EMD Trebles Rebuild Branch

The Jacksonville, Fla. factory branch of the Electro-Motive Div. of General Motors has been increased in size from 26,880 sq ft to 77,568 sq ft, almost three times its former size. The expansion was said to have been made necessary by the growing use of GM's diesel motive power by southeastern railroads. The plant rebuilds major components of diesel locomotives.

To mark the formal opening of the increased facilities, a reception to railroad men was given by N. C. Dezendorf, vice president of GM and general manager of the division. In his address, Mr. Dezendorf revealed that reports furnished by the ICC show that the railroads are saving considerably more than $600 million a year in fuel costs alone through diesel operation. He called the factory rebuild services a new avenue to savings and added that it has been found necessary to add a seventh rebuild plant at Salt Lake City to the network of facilities.


C.A.V.
The world's largest manufacturers of Fuel Injection Equipment
for diesel engines
Depots and Service Agents in over 100 countries
C.A.V. DIVISION OF LUCAS ELECTRICAL SERVICES INC., 653, TENTH AVENUE, NEW YORK 19, N.Y.
Sales Office: 14820 DETROIT AVENUE, CLEVELAND 7, OHIO.
C.A.V.
Fuel Injection and Electrical Equipment
174-605

Up Aluminum Piston Life

Diesel fleet operators are using a bonded bi-metallic piston, sold under the trade name of Dualoy, to increase mileage between overhauls. It is said to combine the advantages of lightweight aluminum with the wearing properties of high-nickel cast iron. These pistons differ from conventional aluminum pistons by having a Ni-Resist ring band cast in and molecularly bonded to the aluminum, using the Al-Fin process.

International Nickel states that Garret Freight Lines, operating its fleet in the Rocky Mts., found no appreciable wear after 199,000 miles of heavy duty service in a Buda Model 844 engine. Rio Grande Motor Way reports an average of 250,000 miles on pistons, rings and cylinder liners before overhaul. The pistons are then reground to the next smaller oversize and put into other engines for a total of 500,000 miles.

Cite So. America Power Lack

Upon return from his recent trip to South America, S. R. Williams, vice president of Worthington Corp.'s foreign business, expressed optimism and a solution regarding the lack of power in Latin America for increasing industrialization.

Great development has taken place toward correcting the power shortage with the establishment of hydroelectric plants, he stated. However, he stressed, to augment facilities that have proved insufficient for power needs and to provide a major source of power for small communities too far away from abundant supplies of water, diesel power plants would supply the answer.

He pointed out that in the United States, there has been a dramatic rise in the use of this type of power plant. In 1920, for example, FPC figures show 90,350 kw were produced by diesel plants. In 1953, these produced 2,207,049 kw. Much of this increase, he said, has been in supplying the needs of small communities. "Today," he added, "there are around 1000 towns that depend entirely on the economical electricity generated by their diesel power plants."

new products

Rust Preventive

A fish-oil-base line of rust-arresting metal coatings which may be applied directly to rusted surfaces with a minimum of preparation, is being produced by the Rust-Sele Co., 9808 Meech Ave., Cleveland 5, Ohio. Only requirement for use is that the surface to be coated be wire-brushed to remove loose rust, paint, scale and dust.

Two basic types have been developed, long-oil coatings for exterior service and short-oil for interior use. Both are available in 24 colors, including white, aluminum and black, and are said to withstand temperatures up to 450°F.

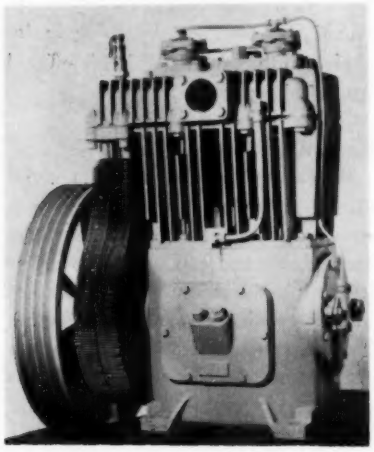
New Replacement Cartridges

Fram Corp., Providence 16, R.I., announces the addition to its line of five lube and fuel oil cartridges. One of them, the C-235, is a replacement lube oil cartridge for International Harvester CUB tractors and the other four are for construction equipment engines of Allis-Chalmers.

Diesel-Starting Compressor

Quincy Compressor Co., Quincy, Ill., is producing a new compressor, Model 350, designed for diesel starting and auxiliary compressed air supply. It is a 2-stage compressor with 6-in and 3¼-in bores and 3½-in stroke with a maximum piston displacement of 51 cu ft. Maximum continuous pressure is 200 psi, and 350 psi intermittent.

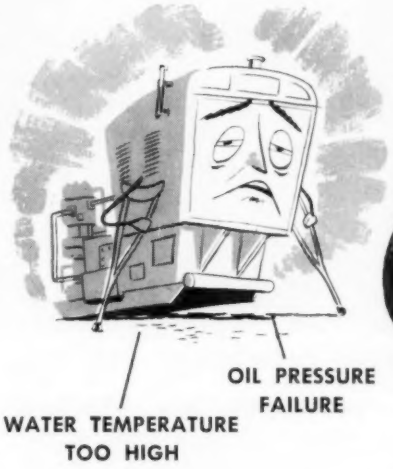
The new model is equipped with "safe-Q-lube" which is said to automatically unload the compressor when the lubricating oil level is low, when the unit is equipped with the company's patented loadless starting. Other new features include a positive displacement lubricating pump and pressure spray to main bearings. The compressor is available with electric motor or gasoline engine drive, or both. Tank or base-mounted models are also available.



Caliper and Height Gauge

George Scherr Co., Inc., 200 Lafayette St., New York 12, N. Y., is producing a combination vernier caliper and height gauge. The caliper becomes a height gauge by adding a scribing attachment with adjustable scriber. Called "Microlock", the model features quick-adjustment and rigid tightness of the slide with a micromatic fine adjustment mechanism. Material used is a high chrome steel.

PREVENT
costly damage
to "sick" engines



USE THIS
PENN
SAFETY
CONTROL

At the first symptoms of a "sick engine" . . . over-heated cooling water or lube oil pressure failure . . . this Penn Control snaps into action and tells you that a "doctor" is needed! It will sound an alarm, flash a warning light, or stop the engine operation . . . *whichever you choose.* Then, you can investigate and correct the trouble before costly damage is done! Learn more about this low-cost engine protection. Write **Penn Controls, Inc., Goshen, Indiana.** Export Division: 13 E. 40th Street, New York 16, N. Y., U.S.A. In Canada: Penn Controls Limited, Toronto, Ontario.

PENN
AUTOMATIC CONTROLS
FOR HEATING, REFRIGERATION, AIR CONDITIONING, GAS APPLIANCES, PUMPS, AIR COMPRESSORS, ENGINES

new literature

Color Welding Movie

A 28-min, 16-mm film, "Welding Advances with Aluminum", has been produced by Aluminum Co. of America, 818 Alcoa Bldg., Pittsburgh 19, Pa. It offers a comprehensive description of aluminum welding using both the tungsten arc and consumable electrode methods, including illustrations of these methods on weld repair of castings and production of weldments.

A-C Industrial Equipment

The complete line of industrial equipment of Allis-Chalmers Mfg. Co., Milwaukee 1, Wis., is pictorially described in a newly revised catalog, "Presenting the Allis-Chalmers Line". The catalog has been expanded to 36 pages to include illustrated information and data on the HD-15 crawler tractor which is now available with a choice of standard transmission or hydraulic torque drive.

Along with crawler and wheel tractors and motor graders, a description is also given of the company's line of motor scrapers and wagons and its expanded line of pull-type scrapers. A 10-page section is devoted to data on the selection of allied equipment and attachments for use with the vehicles.

Dual-Fuel Engines

Worthington Corp., Harrison, N.J., announces a new bulletin on its dual-fuel engines for R.E.A. generating stations, sewage disposal, private and municipal utilities, pipeline pumping, industrial power, and irrigation and drainage. The 36-page bulletin, S-500-B57, gives photographic examples of each application, together with vital statistics, case histories, and comments on fuel consumption.

A page or more is also devoted to each feature: the dual plunger fuel injection pump, the automatic fuel switcher for automatically changing from gas to oil fuel operation, the automatic thermal air control, and the micro-metering gas valve for controlling fuel gas supply to individual power cylinders.

Hose Clamp Applications

Punch-Lok Co., 321 N. Justine St., Chicago 7, Ill., has published a 24-page booklet entitled "Clampways Ideas", based on results of a contest for gathering interesting case histories of unusual uses for the company's hose clamps.

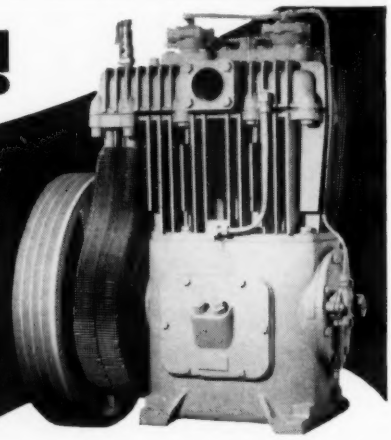
Although the great majority of the clamps are used on hose, the contest disclosed a wide array of production, maintenance, and repair applications. The best of these is included in the booklet which is offered free of charge.

Cemented Carbides

A new edition of its methods manual on cemented carbides has been issued by the Carmet Div. of Allegheny Ludlum Steel Corp., 2020 Oliver Bldg., Pittsburgh 32, Pa. Information includes tool design, brazing, grinding, chip breakers, coolants, cutting speeds and reference data. All grades of the carbides are listed along with their typical applications.

NEW!

Quincy COMPRESSORS WITH safe-Q-lube



New Model 350 with safe-Q-lube is a two-stage air-cooled unit designed for diesel applications. The Model 350 has a 6" & 3¼" bore x 3½" stroke and a 51 cu. ft. piston displacement. Maximum continuous pressure is 200 p.s.i., maximum intermittent is 350 p.s.i.

GIVE YOU MORE DEPENDABLE COMPRESSED AIR FOR:

• DIESEL STARTING • AUXILIARY AIR SUPPLY

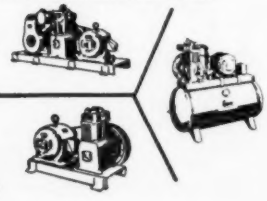
Quincy Compressors are now equipped with New safe-Q-lube to automatically open the intake valve — unload the compressor — whenever the lubricating oil is low. When the compressor is unloaded, lack of air signals operator.

Safe-Q-lube also operates Quincy's Patented Loadless Starting which protects motor and drive from starting overloads. And safe-Q-lube does it with 62% fewer parts for lower maintenance and replacement.

Write for details on new Model 350 and other Quincy units with safe-Q-lube for diesel service. Write Dept. J-36, Quincy Compressor Co., Quincy, Illinois.

THE MAKERS OF THE WORLD'S FINEST COMPRESSORS

QUINCY COMPRESSOR CO.
QUINCY, ILLINOIS



Branch Offices: New York • Philadelphia Atlanta • Detroit • Chicago • St. Louis • Dallas • San Francisco

Manufacturers of Air Compressors Exclusively

organizational news

Alco Engineering Manager

As another step in its continuing diversification program, American Locomotive Co. has appointed Martin Ettington as general manager of engineering, with charge of all product engineering activities at the company's six plants.

Martin Ettington

Mr. Ettington joined the Alco Products Div. of the company in 1936 and was named manager of engineering sales in 1947. In 1953, he was appointed director of engineering for the division, which post he leaves for his present assignment. Prior to joining the company, he was employed by The Empire Oil and Gas Co. in engineering capacities and was assistant manager of its Ponca plant when he affiliated with Alco.

Baldwin Changes

Baldwin - Lima - Hamilton Corp.'s Eddystone Div. announces the retirement of Edward J. Harley, a veteran of 48 years of service. Mr. Harley has been chief assistant mechanical engineer and manager of diesel engineering for many years. During World War II, he worked with the Transportation Equipment Div. of the War Production Board and since then has represented the company in South America and Europe with locomotive sales and engineering.

Robert P. Bolster

In another announcement the Hamilton Div. of the company makes known the appointment of Robert P. Bolster as northeastern representative of the diesel department. His new territory will include Canada, New England and upper New York where he will handle both marine and stationary diesel sales for Hamilton and Baldwin engines.

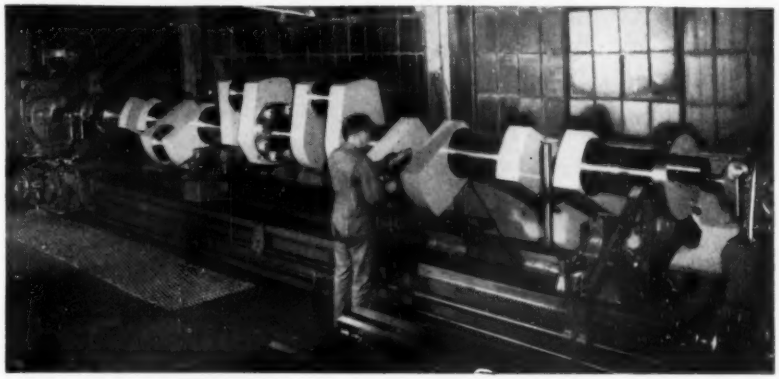
Mr. Bolster was formerly regional and export manager for the diesel division of The National Supply Co. in New York and later branch manager at its Gloucester plant. He began his career thirty years ago at the Worthington Pump and Machinery Corp. and was afterwards associated with the De La Vergne Machine Corp., remaining with that company when it became a division of the Baldwin Locomotive Works in Philadelphia.

Cummins Sales Service Manager

J. W. Fisher has been promoted to the position of service manager for Cummins Sales & Service, Inc. in Wichita, Kan., according to a recent announcement from the organization's Fort Worth headquarters.

Mr. Fisher formerly served as shop foreman. He is a long-time employee of the company and began at the Wichita branch in 1943.

DIESEL CRANKSHAFT REPAIRING AND REFINISHING



The above shaft had one damaged crank throw and center coupling section replaced, also completely refinished all over. We repair and refinish shafts of all sizes and types. Some damaged shafts straightened and the crankpins refinished in place. All types of heavy power plant and marine equipment serviced and repaired.

We give special attention to emergency work. Our services include experienced personnel available for on location inspection and work, or to recommend action. Our facilities include portable equipment and the ability to handle many types of cost saving field repairs.

We now manufacture a portable precision type crankpin refinishing machine for sale and invite your inquiries.

WASHINGTON IRON WORKS, INC.

Established 1876

SHERMAN, TEXAS

news of our industry

Canada Diesel Truck Bid

Canada's *Financial Post* reports that one of Europe's biggest producers of diesel vehicles, Leyland Motors of England, is launching an aggressive bid for Canada's diesel truck market, despite formidable competition from United States' firms.

Leyland Motors (Canada) Ltd., Canadian arm of the company, is making the sales bid with a new product designed in Canada to meet that country's standards—the Super Beaver Mark IV. It is a 175-hp diesel tractor with a list price of about $13,500. Later this year, the company will broaden its line with units above and below that horsepower. Greater emphasis is planned on production of vehicles for the construction industry, such as dump trucks.

The basic engine of the truck is still imported from England. However all auxiliaries including fuel pump, compressor and generator drives, flywheel, inlet and exhaust manifolds, are machined in Canada. Most of the standard equipment used by North American producers such as front and rear axles, transmission, brakes, etc., will be included.

Leyland is developing its own machine shop facilities for production of many parts previously imported. The company also plans to broaden its servicing network as part of its drive for sales. The use of both U.S. and Canadian parts, it is claimed, will be of great advantage to the company's competitive position. For example, the Spicer transmission in the new model can be serviced at any garage.

Centrico Buys Westfalia Line

Centrico, Inc. recently announced that it has purchased the entire spare parts and machine inventory of the Westfalia line of equipment, plus the right to use the Westfalia trademark, from Columbia Westfalia Centrifuge, Inc.

The company also made known that it has taken over Columbia-built machines in order to permit servicing and repair of these units, but it will not sell Columbia separators. Only the original Westfalia line will be handled.

JCL Orders 7 Train Masters

Fairbanks, Morse & Co. announces that it has received an order for seven 2400-hp Train Master diesel locomotives from the Jersey Central lines. Amount of the order is approximately $1,700,000.

The locomotives, to be built in the company's Beloit, Wis. plant, were purchased for use in suburban commuter service in the New York metropolitan area. Longer passenger trains, to be pulled by these locomotives on faster schedules, will be placed on the railroad's mainline commuter service this spring.

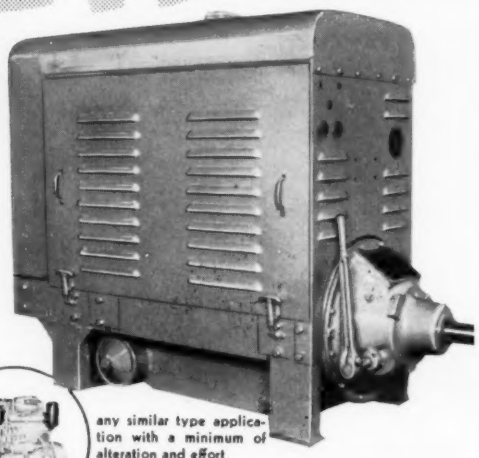
Diesel for Gas Turbine Test

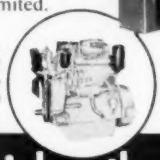
Leyland Motors Ltd., England, is reportedly preparing to supply a direct-injection diesel power unit to the North British Locomotive Co., Ltd. It will serve to power the auxiliary generating set on an experimental coal-burning gas turbine locomotive.

2 NEW Sheppard DIESELS

75 H.P. Model 16

The new Sheppard Model 16 makes conversion to diesel easy. It is extremely compact having been originally designed to power a new Sheppard Row-Crop farm tractor. As a result, the Model 16 lends itself ideally to any type installation where space is limited.



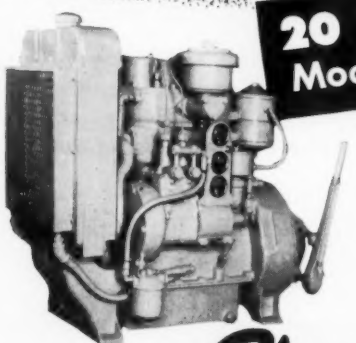


Fan to flywheel Model 16, as used in the Sheppard SD-4 Farm Tractor, will replace gasoline power in any similar type application with a minimum of alteration and effort

For the jobs others Can't Handle

20 H.P. Model 17

LASTING REPLACEMENT
for small engines in heavy-duty service



The new Model 17 fits into the same space as the gasoline engine replaced, but it provides diesel ruggedness for continuous heavy-duty operation. It will reduce fuel costs 75%, yet its original cost is only slightly more than gasoline power. The simplified Sheppard Fuel Injection System puts the Model 17 within the operating "know-how" of every power user.

Free literature will give you complete details on the Sheppard Diesel you need. Drop us a line today.

Sheppard DIESELS
HANOVER, PENNA.

Power; 5 to 100 Horsepower · Electricity; 2 to 40 K. W. Industrial Wheel Tractors · Farm Tractors

new products

Steam Cleaning Compound

Oakite Products, Inc., 19 Rector St., New York 6, N.Y., announces development of a new cleaning material, Composition No. 93, designed for use in steam-generating equipment and in steam guns where the solution is siphoned from an auxiliary tank.

A white, free-flowing powdered material, the compound is claimed to be readily soluble in water in a broad range of concentrations and use, and when added to water up to 20 grains in hardness, to show no precipitate or turbidity. Normal working concentrations range between ¼ oz and 4 oz per gal of water. Solutions are said to be non-toxic, with no unpleasant odors or fumes given off.

6-Ton Grease Gun

E. D. Allmendinger, Inc., 7 Water St., New York 4, N. Y., has announced a 6-ton grease gun for use with all chassis lubricators. The gun can be used as a control handle for lubricating at normal pressure, and by manipulating handle, pressures can be built up to 12,000 lb when required.

The gun is said to be ideal for heavier greases which require higher pressures for efficient lubrication. It also enables a truck to be greased while fully loaded.

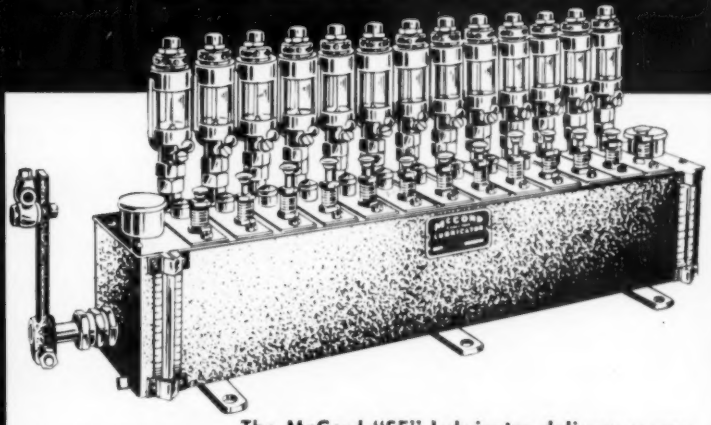
Engine Indicator Valve

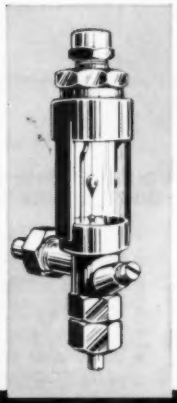
Bacharach Industrial Instrument Co., 7301 Penn Ave., Pittsburgh 8, Pa., is introducing an engine indicator valve which instead of using the tip of the valve spindle as the seating element, uses a free-floating nickel-alloy ball.

By the engine pressure, when the valve is closed, the ball is forced into a conical seat. In this closed position, the valve spindle is backed away from the ball and thus shielded from the direct flame of combustion. Galling of the threads and sticking of the spindle in the gland is prevented. Valve is opened by one turn of the handwheel, which causes the spindle to move inward and forces the ball off its seat.

The new design, making possible opening and closing of valve by hand pressure, is said to assure positive, tight closure under all operating conditions. This permanent pressure tightness is said to be of particular importance for application on gas engines and compressors where accidental opening of an indicator valve may result in hazardous conditions due to escape of combustible gases. Another practical advantage claimed for the valve is that it does not have to be removed from the engine for replacement of any of its parts.

McCORD "Tubular Clearsite" Feed
SF LUBRICATOR





The McCord "SF" Lubricator delivers a predetermined quantity of oil under pressure at regular intervals to cylinders or bearings. A new improved tubular clearsight feed, a McCord development, shows delivery and quantity of oil. It may be cleaned without removing from pump. Other McCord advantages are easy removal of pump units, welded steel tanks, wide variety of drives, and a new graduated oil level gauge providing greater visibility. McCord offers you an outstanding lubricator, further improved to provide better service. Deliveries are prompt.

LUBRICATOR DIVISION
McCORD CORPORATION
Detroit 11, Michigan

news of our industry

Diesel vs Gasoline Auto

The greatest sales attraction of the diesel car in Europe is said to be the savings in fuel cost per mile. Recently, a comparison was made in Italy between the Fiat Type 1400 diesel automobile and its gasoline-engined counterpart.

The automobiles were tested at steady speeds ranging from 30 to 60 mph. At the speed of 30 mph, the diesel traveled 55 mpg and the gas model 33 mpg; at 40 mph, the diesel dropped to 47.5 mpg and the gas 32 mpg; at 50 mph, the diesel went 39.5 mpg and the gas 29 mpg; at 60 mph, the diesel took on 31.5 mpg and the gas 25.5 mpg. Average for the entire test was 33.9 mpg for the diesel and 24.2 mpg for the gasoline automobile. Savings by volume ranged from 40 to 19 per cent, with an average of 28.5 per cent for the speed range tested.

The *Oil Engine and Gas Turbine*, British journal, which published the figures, states that in many countries the extra first cost of a diesel-engined car may be wiped out in a little over a year, due to the marked difference in price between the two fuels. However, in England the differential is small if one normally buys non-premium gasoline grades and higher if premium grades of gasoline are bought and if diesel fuel is purchased in bulk.

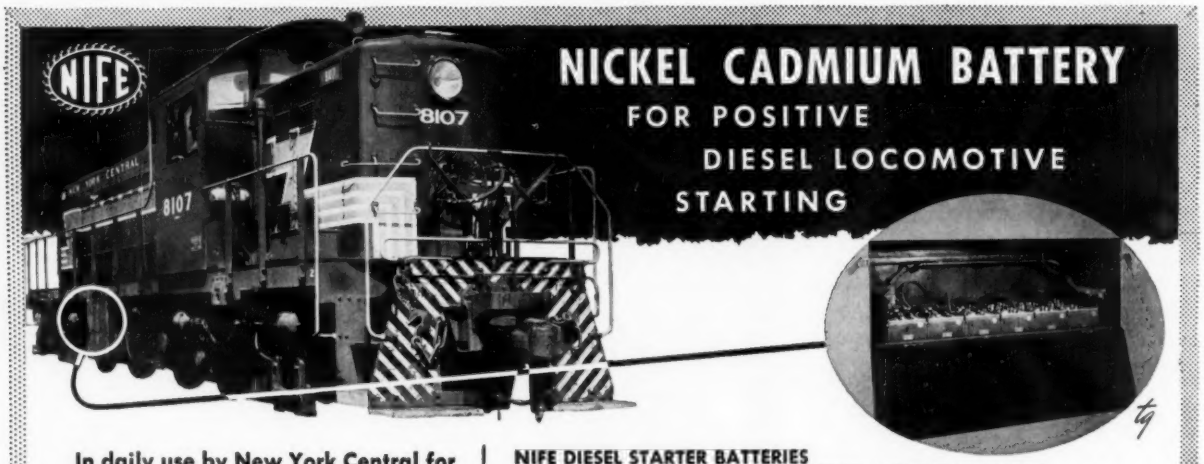
Taking the consumption rates for the whole test, they indicate that the diesel car would save its owner 0.66 pence per mile run for fuel alone. Taking Italian purchase prices in the equivalent of 909 pounds for the diesel version and 795 pounds for the gasoline car, they estimate that fuel savings would wipe out the extra first cost after some 41,500 miles at British fuel prices.

The diesel car is 2½ cwt heavier than the gasoline model. Some of this is due to use of 24-v electrical apparatus. More noise resulted with the diesel but no serious vibration when idling in neutral. It was also said that when underway, a passenger would not be likely to note any difference between the "manners" of the two power units. Hill-climbing was said to have proved better with the diesel, but acceleration through the gears was not as good. Change from top gear to third on a hill was called for only when speed dropped below 20 mph; third was good for 41 mph, and second for 27 mph.

Sasol to Open Operations

The first full-scale commercial attempt to directly process low-cost shale coal into petroleum at competitive prices will be started this summer by the South African Coal, Oil and Gas Corp. (Sasol), in the Orange Free State.

The plant, being built by the M. W. Kellogg Co., is on top of a large coal field and on the banks of a river. Daily liquid production is expected to reach 5000 bbl, plus 110 tons of solids. Output will also include 4,500,000 gal of diesel fuel. Sasol estimates that it will be able to process one ton of coal, costing about 84 cents, into fuel and chemical products worth about $9.10.



NICKEL CADMIUM BATTERY
FOR POSITIVE
DIESEL LOCOMOTIVE
STARTING

In daily use by New York Central for the toughest starting job—switching service.

Because of their rugged mechanical and electrical characteristics, NIFE batteries maintain high starting power throughout their entire long lives. Many NIFE diesel starting batteries have been in continuous successful operation for 15 to 20 years.

"LONGER LIFE WITH NIFE"

NIFE

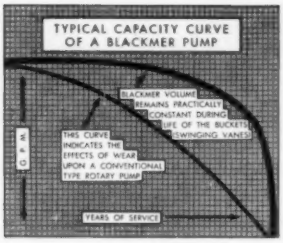
NIFE DIESEL STARTER BATTERIES PROVIDE YOU WITH THE FOLLOWING SALIENT FEATURES:

- Proven extra-long life
- Steel construction throughout
- Greater resistance to shocks and vibrations
- Extremely low internal resistance
- Superior starting ability
- Immune to excessive discharges and short circuits
- No sulphating or similar disintegrating processes
- Not sensitive to overcharging
- Low operating and maintenance costs

NIFE BATTERIES ALSO USED FOR:

• Car lighting • Air conditioning • Signaling • Electric trucks

NIFE INCORPORATED • COPIAGUE • LONG ISLAND • NEW YORK


TYPICAL CAPACITY CURVE OF A BLACKMER PUMP
BLACKMER VOLUME REMAINS PRACTICALLY CONSTANT DURING LIFE OF THE BUCKETS OR SWINGING VANES
THIS CURVE INDICATES THE EFFECTS OF WEAR UPON A CONVENTIONAL TYPE ROTARY PUMP
YEARS OF SERVICE

BLACKMER DESIGN *means low pumping costs . . .*

1. Blackmer's swinging and sliding vane principle assures maximum efficiency, positive priming characteristics, and continuing high rate of delivery. Metallic or composition vanes which are self adjusting for wear insure peak performance through years of hard use. When the vanes finally wear, it is easy to replace them and restore the pump to normal capacity in a matter of minutes.
2. The Blackmer design also features replaceable cylinder liners enabling pumps operating under severe conditions or corrosion and abrasives to be renewed at minimum cost.
3. Proper shaft alignment and easy maintenance result from the use of heavy duty bearings which are isolated from the pumpage.
4. The Blackmer pressure control valve, an integral part of the pump, provides minimum variation from set pressure and protects the unit against damage by accidental shut-offs in the discharge system.
5. Pumps are available with speed reduction equipment for operation by all types of power drives (Motors, Engines, Turbines, etc.)
6. Blackmer rotary pumps supply the answer to a wide range of LIQUID MATERIALS HANDLING problems involving delivery to 1500 GPM — viscosities through 100,000 SSU — discharge pressures through 150 PSI — temperatures to 600°F.

liquid materials handling

BLACKMER

Industrial, Hand and Truck Pumps, Strainers, Pressure Control Valves
BLACKMER PUMP COMPANY, GRAND RAPIDS 9, MICH.
DIVISION SALES OFFICES — NEW YORK • ATLANTA • CHICAGO
GRAND RAPIDS • DALLAS • WASHINGTON • SAN FRANCISCO
See Yellow pages for your local sales representative

YOUR OLD INJECTORS REBUILT EQUAL-TO-NEW

GM DIESEL POWER

Series 51-71-110 perfectly restored to original factory specifications by factory authorized source

No reworked, no discarded parts unfit for further use. Through authorized source, you get finest workmanship, fresh-from-factory replacement parts of latest design and greatest efficiency. Investigate this money-saving plan to renew your old injectors.

IF IT COMES FROM GRIFFIN GUARANTEED IT'S GOT TO BE RIGHT

AFI

GM DIESEL POWER

Headquarters for G.M. Parts & Service
GRIFFIN EQUIPMENT CORP.
880 East 141st Street, New York 54
MElrose 5-7707

new products

2-Wire Midget Thermostats

A new series of precision midget thermostats, weighing little more than a 25-cent piece, has been developed by Fenwal Inc., Ashland, Mass. The heat controls are ¼-in diam and about 2⅜-in long. Because of their small size and double-lead design, they may be used where installation space is closely limited, wherever overheating might endanger a process or mechanism.

The units feature built-in temperature anticipation, fast reaction time, short heat transfer path, a wide operating range and uniform sensitivity, and are said to be stable under shock and continuous vibration. They are factory-set to actuate at any selected temperature in the range of —65°F to 450°F, with an accuracy of 1°F to 5°F, and are designed for 1-amp service at 115-v AC or 32-v DC.

Three different models to permit a variety of mounting arrangements comprise the line. One model has a triangular mounting flange; the second has a threaded hexagonal head for mounting in a tapped hole; and the third has a stud locator to facilitate mounting in a slotted hole.

Inside Adjustable Gauges

A complete line of inside adjustable gauges ranging in size from 3/8 in to 2 in, with special sizes available on order, has been put on the market by Barnaby Mfg. Co., 74 Knowlton St., Bridgeport, Conn. The size range is said to be well adaptable for regular use in toolrooms, inspection and production departments.

The gauges are claimed useful not only for inspection of inside diameters but for checking bell-mouth and out-of-roundness. They can be held to micrometer limits regardless of hand pressure or tolerance. The tools are hard-chrome plated and have a solid collet steel head, hardened and ground. Sizes under an inch have gauging increments of 0.100 in and those from 1 in to 2 in are differentiated by 0.250-in increments.

Battery Power for Welding

A portable battery unit to supply power for welding studs up to ½-in base diameter is being offered by KSM Products, Inc., Merchantville, N. J., for welding where no power lines are available or when existing lines are unable to handle additional load. The unit is completely integrated and independent of power lines except for recharging.

A tap regulator switch regulates current supply. "Off" position eliminates external terminal short-circuiting when unit is not in use. Output terminals for control box connections are two threaded studs and wing nuts. An ammeter indicates charging current and a circuit-breaker switch protects against excessive input charging.

When connected to a 115-v, 60-cycle AC source, 12 heavy-duty wet batteries of 150-amp hr rating are kept charged by an integral automatic charger which test-checks every 10 min and charges when terminal voltage is below normal.

HILCO

LUBE and FUEL OIL PURIFICATION . . .

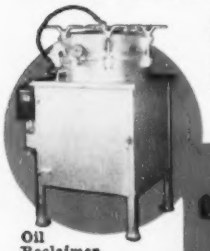
GET RID OF DIRTY OIL . . .
GET LOWER OPERATING COSTS
LONGER EQUIPMENT LIFE

HILCO oil purification means complete oil purification! With a HILCO you get removal of sludge, acids, carbon, water and fuel dilution economically and efficiently. HILCO operation is continuous, all-electric and automatic.

Clean oil at all times reduces down time, increases production and HILCO units pay for themselves in savings.

HILCO offers a wide range of oil purification units . . . one to meet your needs. Write us about your equipment . . . and get recommendations at no obligation.

THERE'S A HILCO FOR EVERY LUBRICATION AND FUEL OIL FILTERING PROBLEM

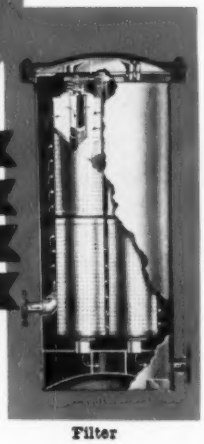


HILCO has 25 years experience in oil purification. Let this experience work for you.

Oil Reclaimer

PURIFIERS
FILTERS
RECLAIMERS
CONDITIONERS

A complete range of sizes and systems for oil purification.



Filter

★ WRITE FOR FREE LITERATURE
NO OBLIGATION ON YOUR PART

THE HILLIARD CORPORATION
120 W. FOURTH ST.
ELMIRA, N. Y.

IN CANADA — UPTON-BRADEEN-JAMES, Ltd.
890 Yonge St., Toronto 3464 Park Ave., Montreal

news of our industry

Radioactive Parts Testing

Caterpillar Tractor Co. announces that it plans to use the products of atomic energy in research work. Radioactive materials will be used to accelerate long-time endurance tests on parts, and are expected to give test results unobtainable by more conventional methods. Parts tested will be sent to Oak Ridge to be made radioactive.

As an example, J. M. Davies, director of research, stated, "We might use radioactive materials to test piston ring wear. By running a radioactive ring in an engine, we will build up radioactivity in the crankcase oil, thus giving a direct indication of the wear on the ring. We can complete the test with the aid of a Geiger counter." First step, it was announced, is to use comparatively low levels of radiation intensity.

Hamilton Engine to Canada

The City of Edmundston, New Brunswick, Canada, has awarded the Hamilton Div. of the Baldwin-Lima-Hamilton Corp. a contract for a diesel generating unit. The 2-cycle, slow-speed, heavy-duty engine will burn Bunker "C" oil. Rated 2400 bhp (1700 kw) at 257 rpm, it will have five cylinders and a bore and stroke of 21½ in by 27½ in. Installation is to be made some time this year.

Reclaim Compressor Cylinders

Van der Horst Corp. announces that it has set up production facilities for the reclamation of diesel locomotive air compressor cylinders. The company states it is now equipped to restandardize oversized cylinders by application of "Porus-Krome" to the bores of the cylinders.

Increased cylinder life and elimination of necessity for stocking oversize pistons and rings are main advantages claimed by the company for this latest application of its patented plating process. Production facilities have been set up at the firm's Olean, N. Y. and Terrel, Texas plants and at the Spar-Tan Engineering Co., Los Angeles, Cal. (Van der Horst licensee).

Argentina Buys Diesel Cabs

Mercedes-Benz has contracted to supply Argentina with 3000 of the organization's 4-cyl medium-sized diesel taxicabs, it was recently learned. They are being shipped in disassembled form to save freightage and to provide local employment on assembly work.

Moose+Diesel=Eugenic Mixup

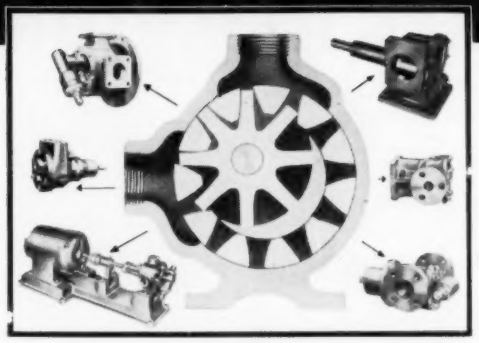
In various past issues of this publication, items have appeared citing the sentimental emotions aroused in certain people concerning the demise of the steam locomotive, especially their nostalgic yearnings for the echoing wail of the train whistle as it passed in the night. In this country, attempts have been made to remedy the situation, most recently the announcement that the New York Central plans to install souped-up versions of the old whistle on its new diesels.

Up in Canada, they were confronted with a different problem. It is said that from the first day diesels went into service on Canadian National lines crossing northern Ontario, they met with a love situation. The moan of the diesel horn as the train sped its way along the tracks for some reason resembled the mating call of the moose. And when a 1900-lb bull moose tried flirting with a skatey-eight ton diesel, results were somewhat disastrous.

Trying to clear up the situation, the Board of Transport issued a proclamation. "It is decreed", the order states, "that all diesel trains in Canada shall have horns having tonal qualities simulating the sound of a conventional steam locomotive whistle. It must be in three tones to produce a harmonious sound and these sounds should be grouped to be omni-directional."

The board approved seven types of whistles and the CNR now has 400 diesels equipped with the whistles. An authoritative description of the sound from the board: "It is not less than 105 decibles in the periphery of a circle 100 ft in radius". The bull's reaction to this has not as yet been ascertained.

SAVE *with* VIKING ROTARY PUMPS BUILT TO FIT YOUR JOB!



With over 600 standard models and many more special units, from which to choose you are assured of a Viking rotary pump built to fit YOUR job.

All are constructed in the time-proved, most-copied of all rotary pump designs—the original Viking "gear-within-a-gear" principle.

This is the principle that assures fast, self priming; smooth even discharge; quick, easy mounting; low power requirements; adaptation for either light, volatile liquids or heavy, viscous liquids.

VIKING AN HONORED NAME IN PUMPING

Send your pumping problem today and ask for folder 545D.

See Our Catalog In SWEETS

VIKING PUMP COMPANY CEDAR FALLS, IOWA

Dependability...

proven on most diesel makes and models

MAKES **DETROIT** *Vernatherm* Engine Thermostats . . .

The *BEST* Choice For Your Needs

If you're concerned with the design of lubricating oil or cooling systems for jet, heavy-duty gasoline or diesel engines it will pay you to specify DETROIT Vernatherm Engine Thermostats. For only DETROIT Engine Thermostats give you the assurance of dependable, efficient operation performance proven on military and commercial aircraft . . . on ordnance combat vehicles . . . and on most diesel makes and models. So take advantage of this outstanding record—specify DETROIT Vernatherm Engine Thermostats, the true standard of the industry for rugged, exacting service! Available as engine cooling thermostats, oil cooler thermostats, shutter thermostats and thermostatic power elements.

All DETROIT Vernatherm Engine Thermostats are . . .

- *Designed to work with either open or closed cooling systems*
- *Built with tight seats for minimum leakage*
- *Not affected by barometric pressure*
- *Not subject to chatter*

ESTABLISHED IN 1877 AS DETROIT LUBRICATOR COMPANY

DETROIT Controls CORP.

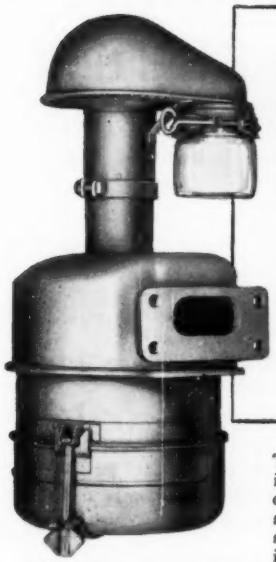
DETROIT 8, MICHIGAN Division of American Radiator & Standard Sanitary Corporation

Canadian Representatives in Montreal, Toronto, Winnipeg - Railway & Engineering Specialties, Ltd.

AUTOMATIC CONTROLS for REFRIGERATION

AIR CONDITIONING • DOMESTIC HEATING • AVIATION
TRANSPORTATION • HOME APPLIANCES • INDUSTRIAL USES

Serving home and industry AMERICAN-STANDARD • AMERICAN BLOWER
CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS



Donaldson Air Cleaners are *EASY TO SERVICE!*

CUSTOM-BUILT TO FIT YOUR ENGINE

Write our engineering department for air cleaner recomendations.

The simplicity and speed of servicing Donaldson Air Cleaners encourages regular attention by the machine operator. No tools are needed to remove oil cup. Cleaning cup and re-filling with oil is a two-minute job. Removable tray makes cleaning out chaff, lint, leaves and larger foreign particles simple and fast.

DONALDSON CO. INC.
666 Pelham Blvd., St. Paul 4, Minn.
Grinnell Division: Grinnell, Iowa
Donaldson Company (Canada) Ltd., Chatham, Ontario

Donaldson *Air Cleaners Mufflers*

Diesel Power Binder

Free

Turns your year's subscription into a lifetime diesel text.

Here is an opportunity to store your back copies in a convenient binder for handy and permanent diesel reference.

Bound in full-grain leatherette, stained in deep maroon, and embossed in gold, it is a handsome addition to any bookshelf.

You can receive this binder FREE merely by renewing your subscription to Diesel Power NOW, thus:

1. guaranteeing YOU uninterrupted service, after subscription's present expiration date, and
2. saving us future clerical work.

To receive this binder, your bonus for renewing without our billing you, just fill out the form below, attach your renewal fee, and return them to us.

* * * * * *

If you would rather enter a subscription for a friend,—fine. We'll still send you the binder and notify your friend that you are sending him a gift subscription.

* * * * * *

We have only 2,000 binders left and over 13,000 subscribers, so reply NOW.

Diesel Power, 192 Lexington Ave., New York 16, N. Y.

Send me a FREE copy of the Diesel Power Binder. Enclosed is the DIESEL POWER subscription fee for the period checked:

U.S. & Possessions ( ) 1 Year $3.00; ( ) 3 Years $6.00
Canada ( ) 1 Year $4.00; ( ) 3 Years $9.00
Elsewhere ( ) 1 Year $5.00; ( ) 3 Years $11.00

EXTEND subscription now going to:

NAME ..... POSITION .....

ADDRESS .....

CITY ..... ZONE ..... STATE .....

COMPANY ..... ITS FIELD .....

OR, send gift subscription to:

NAME ..... POSITION .....

ADDRESS .....

CITY ..... ZONE ..... STATE .....

COMPANY ..... ITS FIELD .....

NOTE: If entering gift subscription, please print your name and address as well as friend's.

SAVE INJECTORS

with

NEW FRAM

Water Separator & Fuel Filter

The new FRAM Water Separator & Fuel Filter is a *double-action* filter for complete injection system protection.

Here's what it does—

100% Water Removal—before injection . . . saves costly injectors from corrosion, rusting, pitting.

Traps Dirt and Dust—Micronic filtration traps and removes dangerous dirt before it reaches injectors . . . ends abrasive action!

Save down-time! Save cost of replacing expensive injectors. Write for information on a new FRAM Water Separator & Fuel Filter for your diesel today!

FRAM®
OIL • AIR • FUEL • WATER
FILTERS

FRAM CORPORATION, Providence 16, R. I.
Fram Canada Ltd., Stratford, Ont.

new products

Diesel Exhaust Conditioner

A catalytic device said to effectively reduce noxious and irritating components from the exhaust of 4-cycle diesel engines has been developed by Oxy-Catalyst, Inc., Wayne, Pa. Called the "Dieseler", the new oxidizing catalyst attaches directly to the engine exhaust manifold. More widespread use of diesel equipment in underground mining and enclosed plant areas will now prevail, according to the company.

The company, in announcing production of the new device, revealed that the first model has been operating successfully for over three months in the limestone mine of the Coplay Cement Mfg. Co. as an attachment to a standard diesel-powered tractor-shovel. Broader application is seen for trucks and buses. Prototype Dieselers have been laboratory tested on engines loaded to simulate work cycles of vehicles and locomotives and are said to have eliminated 65 to 85 per cent of hydrocarbons and 80 to 90 per cent of carbon monoxide.

The first development in this line was a catalyst for unleaded gasoline engines. Both types make use of oxidizing catalysts developed by Eugene J. Houdry, pioneer of the catalytic cracking process in petroleum refinement, and president of the company. They are the same catalysts, called Oxycats, that have been used for air pollution control and waste heat recovery in industrial stack installations. Engineers are now working on a third device for 2-cycle diesel engines.

The catalyst unit installed on the 62½-hp tractor-shovel at Coplay sits on the front of the machine, atop the engine, connected directly to the exhaust manifold. It is a twin-flow, heavy-gauge steel assembly containing eight catalytic sections, with overall dimensions of 7 in by 12 in by 27 in. Each catalytic unit is a compact porcelain structure containing 73 slender porcelain rods which are coated with the catalytic agent—alumina and platinum alloy. As the hot engine gases flow across these rods, they are catalytically burned to carbon dioxide and water vapor. Back pressure is said to be negligible because of the streamlined cross section of the rods.

Emergency Light Unit

Dual-Lite Co., 186 Front St., Bridgeport 6, Conn., announces production of a new emergency light, Model CH-25, with a nickel cadmium battery. Rated life expectancy is 15 to 20 years.

Said to be ideal for buildings where a sudden power failure might have serious results, the unit contains two 6-in heads with adjustable sealed beam lamps for giving approximately three hours of lighting. Operation is completely automatic. The unit has automatic trickle charging with provisions for switching to high-rate charge, a test switch and voltmeter for testing battery, and is for use on 115-v AC, 60 cycles. The battery is 5-celled with a 6-v, 30-amp capacity.

Transformer for Added Power

A 3-phase transformer developed by The Leece-Neville Co., 5109 Hamilton Ave., Cleveland 14, Ohio, makes it possible to obtain up to 1200 watts of auxiliary 110-v DC power for operation of tools from automotive vehicles equipped with the company's alternator system. Output is independent of motor speed.

The new transformer (along with a companion 110-v selenium rectifier) is operated in parallel with the standard rectifier and voltage regulator, and leaves alternator undisturbed for its primary purpose of supplying power for battery charging and vehicle operation. Two models of the transformer are available. For 6-v systems, the 1013-T is rated at 800 watts. For 12-v systems, the 1012-T unit has an output of 1200 watts.

SAVE MONEY ON DIESEL UPKEEP

free booklet tells how . . .

THIS illustrated booklet contains a wealth of sound, practical ideas to expedite Diesel maintenance, keep operating costs low and extend equipment life. Gives details on such subjects as:

- Cleaning filters
- Desludging lube oil coolers
- Descaling jacket water coolers
- Degreasing engine parts before repair
- Steam-detergent cleaning
- Plant maintenance cleaning

Booklet also discusses tested Oakite procedures for streamlining maintenance in steam control stations and electric power plants.

FREE copy of this 44-page booklet yours on request. Consult your local Oakite Technical Service Representative. Or write address below. No obligation.

OAKITE PRODUCTS, INC.
22C Rector Street, NEW YORK 6, N. Y.

Technical Service Representatives Located in Principal Cities of United States and Canada

SPECIALIZED INDUSTRIAL CLEANING
OAKITE
MATERIALS • METHODS • SERVICE

Technical Service Representatives Located in Principal Cities of United States and Canada

Diesel Men Specify STRATOFLEX

STRATOFLEX Precision Elbow Hose Fittings are designed and engineered to fill your requirements. Whatever your specifications in detachable reusable hose fittings, and flexible hose assemblies, specify STRATOFLEX!

PRECISION ELBOW HOSE FITTINGS

- AVAILABLE IN ALUMINUM OR STEEL
- ALL SIZES • ANY ANGLE OF BEND
- FLANGE & SWIVEL NUT CONNECTIONS

WRITE FOR COMPLETE INFORMATION

STRATOFLEX

STRATOFLEX INC.—FORT WORTH, TEXAS
P. O. BOX 10398

BRANCHES:
ATLANTA • CHICAGO • DAYTON • HOUSTON • KANSAS CITY
LOS ANGELES • MINNEAPOLIS • NEW YORK • ODESSA • TULSA

IN CANADA: STRATOFLEX OF CANADA, INC.—TORONTO 18, ONTARIO

Here's something NEW in straight-form thermometers

THEY OFFER THESE OUTSTANDING PLUS FEATURES

DURABILITY—All parts of the new Rochester straight-form thermometers (except crystal) are of corrosion-resistant stainless steel. All are fused into a single unit by an exclusive welding process. Hermetic sealing assures easy reading of dial under any operating condition. No clouding.

EXTERNAL RECALIBRATION — Only Rochester thermometers can be recalibrated externally. A screw adjustment permits you to restore accuracy even if you knock the thermometer out of adjustment with a hard blow.

SELECT YOUR STEM POSITION —This thermometer is ordinarily supplied with the stem located at the bottom. However, it can be placed at the location you desire around the entire dial circumference. Available in stem lengths from 2½ to 48 in. Send for further information today. Write:

Rochester Manufacturing Company, Inc.
34 Rockwood St., Rochester 10, N. Y.

ROCHESTER DEPENDABLE ACCURACY GAUGES

DIAL THERMOMETERS GAUGES AMMETERS

What Do You Know!

(*Answers to questions on Page* 109)

1. Both "a" and "b" are correct. "a" is the essential ingredient and "b" will act as a catalyst to promote the condition rapidly. For detailed discussion, see Page 74.

2. Correct answer is "a". While these media will remove oil-soluble oxidation products effectively in all oils, they also remove some of the additives in the heavy-duty oils and are thus not suitable. See the article above.

3. "b" is correct answer. There are both advantages and disadvantages to be considered in "wet" centrifuging and these are detailed in the article mentioned above.

4. Correct answer is "b". Volume of delivery must be checked at a minimum of two speeds in the pump's normal range to have any assurance of satisfactory condition. See the article on Page 101 for details.

5. Both "b" and "c" are correct. The effect in "c" is achieved by performing the operation in "b". For discussion, see above article.

6. "a" and "b" are primary results that may occur from traction motor overspeeding. However, if "b" occurs, "c" almost invariably follows as a secondary effect. See the article on Page 103.

7. Correct answer is "a". Tests show that wheel slip cannot be correlated with certain speeds, motor connects, and field strengths, with any particular accuracy. See the article mentioned above.

8. "a" is correct. The excellent balance of radial engines permits substantial reduction in foundations. See the article on Page 68.

9. Both "a" and "b" are correct. Cooling the air results in "b", which in turn results in "a". See article above and also one on Page 70.

organizational news

F-M Executive Elevations

At the annual meeting of the board of directors of Fairbanks, Morse & Co., O. S. Leslie, vice president in charge of manufacturing, was elected to the board. A subsequent meeting resulted in the selection of J. A. Cuneo, former general sales manager, to vice president in charge of sales, and Robert B. Craig, formerly assistant to the president, to a vice presidency with headquarters in Washington, D. C.

Mr. Cuneo joined the organization in 1929 as a field engineer. He was later manager of the Havana branch and subsequently became assistant manager of the export division and a member of the organizing staff of the concern's Mexican company. In 1951, he became general sales manager, following managership of the Los Angeles branch.

J. A. Cuneo

Nickel Cadmium Manager

The appointment of Theodore Ulrich to the post of Chicago district manager for sales and service has been announced by the Nickel Cadmium Corp. Mr. Ulrich has been a sales engineer for the Minnesota Mining Co. since 1948.

Pedrick Sales Manager

The appointment of Harold R. Kelly as sales manager of Pedrick piston rings for the Industrial Div., has been announced by Wilkening Mfg. Co. Mr. Kelly has been with the company since 1941. He succeeds Roy Magarial, who has organized his own company as manufacturers' agent.

NOW SHOWING

"WHAT YOU SHOULD KNOW ABOUT DIESEL ENGINES"

NEW P&H COLOR SOUND FILM

It's an all-new sound-slide film . . . that provides clear, concise answers to "What you should know about Diesel engines." Give it a showing, and it will give you a better A to Z understanding of the diesel engine — how it operates; how it compares with gasoline engines; two versus four cycle diesels; why P&H Diesels perform better on tough jobs; how they save money on both operating and maintenance costs.

Plan a review of this educational and entertaining color sound-slide film. Ask your P&H dealer about it . . . or write us for details.

P&H

DIESEL ENGINE DIVISION

HARNISCHFEGER CORPORATION CRYSTAL LAKE, ILLINOIS

the P&H line

FULL FLOW • FULL FLOW • FULL FLOW • FULL FLOW • FULL FLOW • FULL FLOW • FULL FLOW • FULL FLOW

EVERYBODY IS TALKING ABOUT . . . . . .

FULL FLOW

But Briggs

PIONEERS IN MODERN OIL FILTRATION

HAS HAD IT FOR 15 YEARS!

Here's the full-flow filter that's packed with LABOR and TIME SAVING FEATURES! All steel, seamless, light weight tanks.

•

UP TO 25 GPM PER CARTRIDGE with EXTREMELY LOW PRESSURE DROP . . .

•

HIGHEST WORKING PRESSURES

NO TOOLS NEEDED

"Exclusive BRIGGS EASI-LIFT COVER"

. . . and there's a Briggs patented DISC-PAC throw-away cartridge to go with this "all-convenience" filter case. The combination will give you more oil and engine protection than competitive material.

IF IT'S THE PEAK IN DIRT TRAPPING and holding that you want . . . if you want to filter out those micronic sized abrasives . . . and give complete protection to your engine . . . then by all means get the latest information on what genuine Full Flow results can mean to you.

WRITE OR MAIL THE COUPON FOR DETAILS ON THE ABOVE.

THE BRIGGS FILTRATION CO.,
Dept. 27
RIVER ROAD, WASHINGTON 16, D.C.

Please send me data sheet on Briggs filter cartridges and your D and H series filter cases.
No obligation, of course!

Name ..... Title .....
Company .....
Address .....

HONAN-CRANE CARTRIDGE REFILLS

for low cost oil filtration

SPECIAL FILTER MATERIALS
that keep
STRAIGHT or INHIBITED OILS CLEANER
. . . on any type of engine

● In the field or in the factory your diesels get full protection against oil contamination with compact, economical Honan-Crane refills. Honan-Crane offers you three specially engineered refills to meet your toughest filtration problems on both straight and inhibited oils in every size and make of diesel. *Write for complete details and prices.*

type "MC" cartridge

A woven cloth bag containing 14 pounds of Cranite (adsorbent type filter material). Recommended for straight mineral oils. Removes all solids, acids and products of oxidation.

type "MF" cartridge

A rigidly-constructed metal container designed for rough field handling. For use where a non-crushable type cartridge is required. Filtering results same as "MS" below.

type "MS" cartridge

Uses specially blended inert-type filter media to remove all solid contaminants—scale, abrasive particles, metal chips, etc.—from both lube and fuel oils. High flow rate.

HONAN-CRANE CORPORATION
305 Wabash Avenue • Lebanon, Indiana
subsidiary of **HOUDAILLE-HERSHEY CORP.**

new literature

Engine Vibration Control

On-the-job photos and case histories showing how representative diesel and gas engine vibration problems have been solved with effective vibration control are included in a new catalog published by The Korfund Co., Inc., 48-15 32nd Pl., Long Island City 1, N.Y. Installations featured range in size from a 16-hp diesel generator set on a truck, to a series of six 1425-hp supercharged diesels at a power plant.

The catalog, PS-4, shows how vibration-free installations are possible with the vibro isolators manufactured by the company, and how they can prevent engine distortion due to twisting of the sub-base. Correctly engineered vibration control, it explains, often permits engine installations without special foundation or reinforcement of existing structures not designed for such equipment, and also often eliminates need for any foundation bolts in the floor.

Another catalog, E1A, treats the selection of proper isolating media. Steel spring isolators are said to provide the most efficient method, approaching 100 per cent in effectiveness. Rubber and cork, when properly applied, are reported to provide good low cost vibration and noise control for non-critical installations.

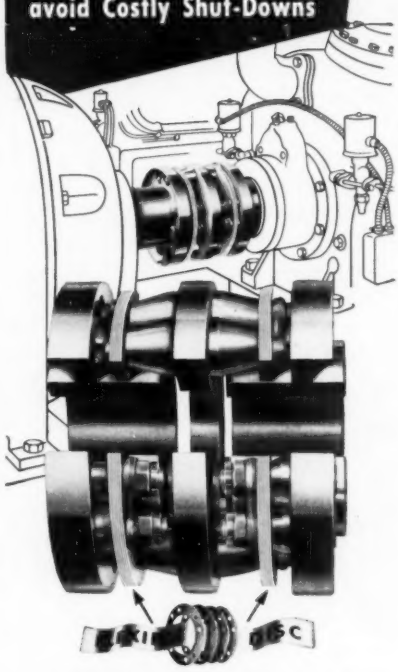
Burmeister & Wain Diesels

Burmeister & Wain, Copenhagen, Denmark, has issued a new catalog on its 4-cycle auxiliary diesels. Engines are from 2 to 7 cyl, and range from 70 to 980 bhp and 400 to 600 rpm. Systems come with and without turbocharging.

Valves for Instrument Piping

Jerguson Gage & Valve Co., 87 Fellsway, Somerville 45, Mass., has issued new data information giving features, application, and specifications on its valves for instrument piping and general use. The 4-page data unit contains illustrations showing how the valves combine unions, nipples, reducers, etc., into one space-saving unit to reduce threaded connections.

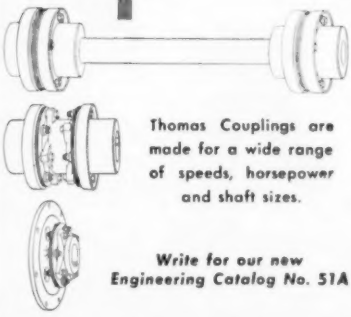
Specify **THOMAS** ALL METAL **FLEXIBLE COUPLINGS**
for Power Transmission to avoid Costly Shut-Downs



Patented Flexible Disc Rings of special steel transmit the power and provide for parallel and angular misalignment as well as free end float.

DISTINCTIVE ADVANTAGES

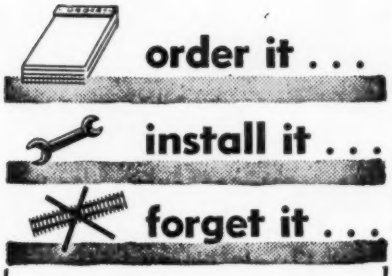
FACTS	EXPLANATION
NO MAINTENANCE	Requires No Attention. Visual Inspection While Operating.
NO LUBRICATION	No Wearing Parts. Freedom from Shut-downs.
NO BACKLASH	No Loose Parts. All Parts Solidly Bolted.
CAN NOT "CREATE" THRUST	Free End Float under Load and Misalignment. No Rubbing Action to cause Axial Movement.
PERMANENT TORSIONAL CHARACTERISTICS	Drives Like a Solid Coupling. Elastic Constant Does Not Change. Original Balance is Maintained.



Thomas Couplings are made for a wide range of speeds, horsepower and shaft sizes.

Write for our new Engineering Catalog No. 51A

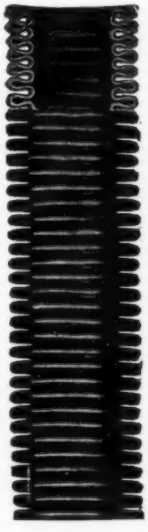
THOMAS FLEXIBLE COUPLING CO.
WARREN, PENNSYLVANIA, U.S.A.



You can do that with ATLANTIC seamless diesel hose which requires no maintenance whatever.

Absolute uniformity of wall thickness . . . no seams or packed joints . . . absolutely tight against water, oil, steam, gas, air . . . dampens vibration . . . . maintains flexibility at extremely high temperatures.

Bronze, Steel, Stainless Steel, Monel — ⅛"—36" I.D. with fittings as needed.



Diesel Bulletins 1020 & 50A furnish complete information.

See our Catalogs in Sweet's Files for Product Designers and Mechanical Industries.

ATLANTIC

METAL HOSE CO., INC.

309 Dyckman St.,

New York 34, N. Y.

news of our industry

Crankshaft Rebuilding Service

To round out its program of furnishing complete rebuilding service on all engine parts, Cleveland Hone & Mfg. Co. announces that it is now equipped to rebuild crankshafts up to 96-in long. Process used is a method of hard chrome surfacing and regrinding.

New equipment installed includes grinding machinery and chrome surfacing equipment for the longer length and an electro heat-treating furnace. Much of the machinery used in this rebuild work is of the company's own design. Complete rebuilding of a crankshaft involves 20 different operations. Magnaflux inspection to assure freedom from hidden flaws is the final step.

Diesel Speeds Mine Production

Down in a gypsum mine near Grand Rapids, Mich., a diesel-driven generator is powering a shuttle-car, replacing the usual set of batteries for this type of operation. According to the Certain-Teed Products Corp., the cost of operating the new vehicle is about $1.70 a day, which is the cost of a day's supply of diesel fuel.

The unit operates 100 ft below surface and is used to move blasted ore to a portable rock crusher located at the base of the mine shaft. Three motors in the vehicle receive a constant, full-volume supply of current from the generator. According to the report, the usual power lag said to be common to battery-operated units after five or six hours of operation is eliminated and the car is able to negotiate grades up to 12 per cent in the mine, as fast at the end of the shift as at the beginning.

The car, manufactured by the Joy Mfg. Co., is powered by a General Motors Series 71 diesel and a 250-v DC Reliance generator. A separate electric motor turns each of the rear wheels and the car conveyor. After ore is loaded, it is transported about one mile along the mine floor to the crusher. Floor of the car, on which the load rests, is actually a conveyor which feeds the ore to the crusher at the throw of a switch.

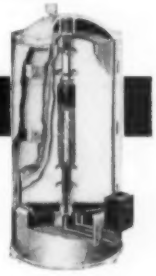
HONAN-CRANE OIL PURIFIERS

designed for diesels!

ENGINEERED SPECIFICALLY
to provide
LONGER LIFE, GREATER EFFICIENCY, LOWER OPERATING COSTS
for all types of diesel engines

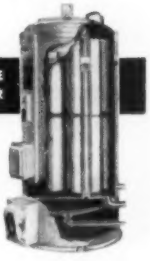
● Three basic models, combining Honan-Crane's advanced engineering features with proven principles of design, meet all diesel engine filtering requirements . . . offer positive protection against costly breakdowns and excessive wear due to contaminated oil. H-C Purifiers are available for any size or make of engine. *Write today for complete information.*

type "B"
BULK REFILL OIL PURIFIER



Uses full size bulk refills of "Cranite" (fullers earth) or "Palconia" (cellulose fiber) filtering medium to remove solids, acids and products of oxidation.

type "M"
MULTI-CARTRIDGE OIL PURIFIER



Uses one to 24 handy, interchangeable refill cartridges containing Cranite, Palconia or cotton waste and excelsior to provide needed range in capacity.

type "F"
FREE-FLOW OIL PURIFIER

Uses interchangeable refill cartridges of Cranite, Palconia or cotton waste and excelsior. Compact design simplifies installation where space is limited.

HONAN-CRANE CORPORATION
305 Wabash Avenue • Lebanon, Indiana
subsidiary of **HOUDAILLE-HERSHEY CORP.**

NO MORE CARBON SCRAPING

*DUNK AND DRIER BASKET INCLUDED

Decarbonizes and Cleans CARBURETORS, FUEL PUMPS, PARTS Like..

U. S. PAT. #2318842*

New 6½ gal., size deep "Vapor-catcher" design pail.

Magic More Potent*

GUNK HYDRO-SEAL

NO MORE CARBON SCRAPING

60 gal. size kits available from stock to clean carbon and water side of bus and truck cylinder heads for Better Thermal Efficiency

*1. Faster . . . Terrific penetration . . . new improved odor.
2. Quickly digests and removes carbon gum, paint, lead, makes possible accurate visual inspection and fitting of delicate metering mechanisms, jets, orifices and diesel nozzles . . . without etching.
3. Lasts more than one year . . . due to water blanket.
4. Works hot or cold . . . Rinses wet or dry.
5. Patented Double Barrel Performance Guaranteed.

SOLD BY BETTER JOBBERS EVERYWHERE

Write for Name of Nearest Stocking Jobber

Flatly Refuse Substitute Imitations

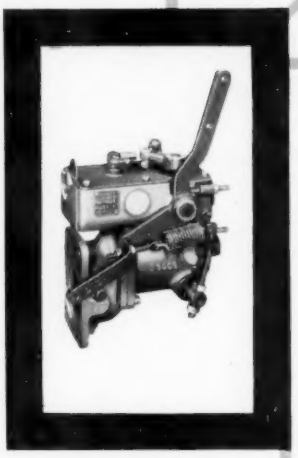
IMMEDIATE DELIVERY 1 PINT OR A TANK CAR

CURRAN CORP. Mfg. Chemists LAWRENCE, MASS.

high in performance

low in cost

parts & service in the field



PIERCE GOVERNORS

for all Gas and Diesel Engines

Pierce centrifugal governors are your most dependable and efficient control mechanisms for industrial engines . . . from small generator sets to monster power units . . . gas (LPG), gasoline or diesel. For engines requiring extra power to position fuel rack or valve, the Pierce centrifugal with hydraulic booster (for original equipment only) is ideal! Replacement governors and parts are available through your local distributor or fuel injection service station.

For distributor's name or information on special governing problems, write

The PIERCE GOVERNOR Co.
INCORPORATED
1614 Ohio Avenue • Anderson, Indiana

PIERCE

"SPECIFY PIERCE CENTRIFUGAL GOVERNORS ON YOUR ENGINES"

new products

Compact Cam Clutches

A new line of cam-type, 1-way clutch units to serve as backstop, indexing, and overrunning clutches in a wide variety of machine drives, has been announced by Morse Chain Co., 7601 Central Ave., Detroit 10, Mich. The units, known as 200 Series, are made with OD dimensions and tolerances corresponding to seven sizes of standard 200 Series ball bearings.

The clutches have no inner race, the full complement of cams bear directly on a hardened shaft surface. Individual clutch units can thus be mounted in a machine housing bore adjacent to the ball bearing supporting the shaft on which the clutch acts. Free wheeling of shafts at speeds up to about 2000 rpm are claimed achievable without excessive temperature rise in the clutches. Lengths of the units run from 1 in to 1¼ in.

Universal Flux

An all-purpose welding and brazing flux is being produced by Andco, Inc., Orchard Park, N.Y., which is said to be usable for all types of gas welding and brazing.

According to the manufacturer, the flux will weld through lead, beryllium, aluminum, bronze, galvanize, copper, and will also braze and weld cast iron and chrome metals. No cleaning is said to be required. Impregnation of foreign substances into metal surfaces and crystallizing of metal are also said to be eliminated.

Vibration-Tested Fuel Tanks

A new series of fuel tanks, said to be vibration-tested for maximum performance, has been announced by Crenlo, Inc., Rochester, Minn. Available in 1- to 50-gal capacities, the tanks are all-welded and provided in cold-rolled steel or terneplate to specification. Those of 10 to 16 gauge are arc-welded and resistance seal welding is used for 16- to 24-gauge tanks.

Stainless Steel Tubing

Flexonics Corp., 1315 S. Third Ave., Maywood, Ill., has developed a high-strength, thin-wall, stainless steel tubing for uses where corrosion-resistance, light weight, and special shapes or bends may be required. The company states it will also engineer special applications of the tubing in combination with fittings and its own flexible tubing or expansion joints.

Stainless steel, the company claims, can be successfully worked into a great variety of shapes and is helping free designers from limitations of heavy, expensive castings or multiple-piece assemblies that are welded or brazed together. Fittings and component parts can be attached to the straight or flexible tubing by resistance circumferential seam welding. Through stainless steel, porosity of castings have also said to have been eliminated. Flexonics has also been forming unusual shaped parts from a single piece of tubing where they were formerly made from two or more pre-shaped shells.

new literature

ASTE Carbide Seminar

The complete presentations of the University of Pennsylvania at the American Society of Tool Engineers' recent carbide seminar are now available.

Entire proceedings of the meetings, held over a 5-day period, covering the economics of carbide in industry, tool fabrication and maintenance, single point tooling results and analysis, new applications, and detailed data on heat, impact, and corrosion-resistance, together with charts and photographs are obtainable in bound form from Prof. Lee N. Gulick, School of Mechanical Engineering, University of Pennsylvania, Philadelphia 4, Pa., at a cost of $3.

Oil Drilling Diesels

National Superior PTDS supercharged diesel drilling engines are described in Bulletin 415 just released by The National Supply Co., Engine Div., Springfield 99, Ohio. Illustrations include cutaway views showing design features, dual-fuel operation, and generator sets.

Continuous and intermittent ratings on the 4-cycle engines described are 485-525 bhp for the 6-cyl model and 650-700 bhp for the 8-cyl model. With radiators, water pump and accessories, ratings of 460-500 bhp are given for the 6-cyl model and 620-670 bhp for the 8-cyl model. Both sets of ratings are for operation at 900 rpm. Starting is by compressed air. Performance curves, dimension diagrams, and specifications are included in the 16-page booklet.

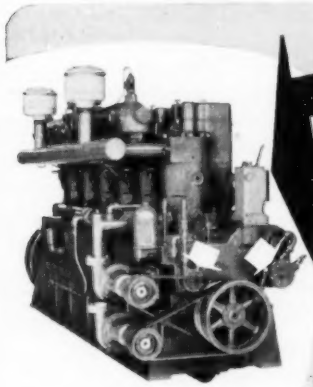
Tubular Electric Heaters

A bulletin on tubular electric heaters for industrial services has been prepared by Turbine Equipment Co., Hynes Electric Heating Div., P.O. Box 578, Westfield, N. J. The bulletin illustrates and describes the component parts of the heaters, including the pipe, resistors, insulators, strap and terminal box, which are said to have wide application for heating heavy oils and other viscous liquids in tanks and pipe lines. It also explains the characteristics of electric heating and gives operating comparisons with steam.

Ampco-Weld Wall Chart

A colorful and informative wall chart, 20½-in by 29½-in, incorporating 9 data charts and 10 photographs, is available from the Resistance Welding Div. of Ampco Metal, Inc., 1745 S. 38 St., Milwaukee 46, Wis.

Featured in the upper left corner are specifications for spot welding similar and dissimilar metals. The other eight charts cover the average properties of Ampco-Weld high conductivity alloys, projection welding, conversions on commonly welded metals, heat balance, secondary amperes and electrode force, and seam welding and spot welding schedules on low carbon steel. Photographs show holders, tips, seam welder shafts and bushings, seam welder wheels, backups, dies, and tips.



For POSITIVE LUBRICATION

It Pays to Specify

TUTHILL PUMPS

For dependable lubrication of diesel engines and power units, Tuthill offers a complete line of positive displacement pumps, designed for lubricating and scavenging. Included are automatic reversing pumps and stripped models for built-in applications.

Write for the Tuthill Pump Guide listing all Tuthill Pumps for lubricating requirements. Send specifications for quotation.

TUTHILL PUMPS FOR ALL PURPOSE

TUTHILL PUMP COMPANY
Dependable Rotary Pumps since 1927
939 East 95th Street, Chicago 19, Ill.

Canadian Affiliate: Ingersoll Machine & Tool Company, Ltd., Ingersoll, Ontario, Canada

"AMOT" THERMOSTAT

"Performance without trouble" is the reason more engine manufacturers, pipe lines, power plants, oil companies and shipyards are using AMOT as standard for automatic engine water and oil temperature control. AMOT thermostats offer the following advantages:

1. Large capacity combined with light weight.
2. Excellent reliability even under extreme shocks and vibration.
3. No external bulbs or tubing to break and cause trouble.
4. Temperature is fixed and cannot be tampered with by operator.
5. Holds close regulation and is not sensitive to pressure.
6. Operating forces are very large and with no packing glands there is no chance of valve ever sticking or becoming inoperative.
7. Because of its simple and rugged construction, practically no maintenance is ever required.
8. Has positive 3-way valve action in which full pump capacity flows through the engine at all times.
9. Compact in size and will operate in any position, which facilitates piping.
10. Available in pipe sizes up to 6" for all types of gas and diesel engines.

Write for catalog and name of your nearest AMOT representative.

AMERICAN MOTORS CO.
RICHMOND CALIFORNIA

FUEL INJECTION SALES & SERVICE

SAVE TIME AND MONEY BY EMPLOYING FUEL INJECTION SPECIALISTS

CALIFORNIA

D—I—G—S

Diesel Injection & Governor Service, Inc.

authorized AMERICAN BOSCH — SALES & SERVICE
AMERICAN HAMMERED PISTON RINGS
Specializing in all types fuel injection systems & governor repair

985 Seventh St. Oakland, Calif.

Phone: Templebar 6-0733

FLORIDA

MIAMI—IN FLORIDA
FLORIDA DIESEL SERVICE CO.

American Bosch Fuel Injection Service

LEECE NEVILLE—DELCO WICO-FAIRBANKS MORSE

1930 N. Miami Ave. Phone 35015

MARYLAND

CENTRAL DISTRIBUTORS

Maryland — Delaware — District of Columbia
For American Bosch and Scintilla Diesel Fuel Injection Equipment Service and Sales

PARKS & HULL
Automotive Corporation

1033 Cathedral Street — Baltimore, Maryland — SA. 7-8383

MASSACHUSETTS

NEW ENGLAND SERVICE

W. J. CONNELL CO.

Diesel Fuel Injection and Governor Service

Newton Industrial Center BOSTON, 64 DEcatur 2-3630

Airport Road HARTFORD, CONN. Tel. 5-3403

MISSISSIPPI

Womack Brothers **DIESEL SERVICE**

******

Diesel Fuel Injections, Starting Lighting, and Magneto Sales and Service

1321 S. Gallatin St. Jackson, Mississippi

MISSOURI

DIESEL FUEL INJECTION SERVICE CO.
9331 S. Broadway
St. Louis 23, Missouri

DISTRIBUTORS OF FUEL INJECTION EQUIPMENT

We service and stock parts for:

American Bosch
Bendix Scintilla
Adeco Products
Demco
Cooper-Bessemer
Fairbanks Morse O.P.
Excello
Caterpiller Nozzles
Cummins Nozzles
GM. 71 Series
GM. 567—278—268
Woodward Governors
Pierce & Handy Governors
Bacharach Nozzle Testers
Motorite Compression Testers
American Bosch Fuel Filters

Phone: Vernon 2-2121

MISSOURI

ST. LOUIS, MO.

2900 Washington Blvd. Phone: Jefferson 7200

Electric Parts & Service Co.

American Bosch Fuel Injection—Electrical
Carburetor & Magneto Service

NEW YORK

AUTHORIZED SALES & SERVICE
American Bosch — Bendix — Demco
We service all makes of
Fuel injection equipment & Hydraulic Governors

A & D Diesel Service, Inc.

145 — 21st St. Brooklyn 32, N. Y.
South 8-3461-7637

NEW YORK

CORETTI-GROSS, Inc.

Complete Engine & Accessory Unit Reconditioning
Gasoline & Diesel

44 SECOR LANE PELHAM MANOR 65, N. Y.
NYC Phone FAirbanks 4-7700 PElham 8-3900

NORTH CAROLINA

Don't Neglect **THE FUEL INJECTION EQUIPMENT ON YOUR DIESEL ENGINE . . . . .**

Getting top performance from a Diesel engine depends on the condition of the fuel injection system. Play safe by getting in touch with us. We have factory trained mechanics and the official repair and testing equipment needed for doing the job the right way.

CAROLINA RIM & WHEEL CO.

301 East 8th St. Phone 7-1093
CHARLOTTE, N. C.

NORTH CAROLINA

DIESEL INJECTION SALES & SERVICE
fully equipped to service
American Bosch, Bendix Scintilla, Caterpillar, Cummins and International fuel systems
Pierce, Marquette & Woodward governors

3015 HILLSBORO STREET RALEIGH, N. C.

OKLAHOMA

MAGNETO IGNITION COMPANY, INC.
TULSA, OKLAHOMA
Authorized Service and Sales
AMERICAN BOSCH — SCINTILLA

701 West 5th PH-2-8197

PENNSYLVANIA

SULLIVAN BROS.

Fuel Injection—Governors
American Bosch Distributors

1718 Fairmount Avenue
445 North 63rd Street

PHILADELPHIA PENNSYLVANIA

TENNESSEE

AMERICAN BOSCH SERVICE STATION
Genuine Parts and Complete Rebuilding
Cummins — Waukesha — Buda — Nordberg — Kohler Engines

PRECISION PARTS CORPORATION

400 N. First St. Nashville, Tenn.

FUEL INJECTION SALES & SERVICE

SAVE TIME AND MONEY BY EMPLOYING FUEL INJECTION SPECIALISTS

TEXAS

BEARD and STONE

FUEL INJECTION — ELECTRICAL — CARBURETOR AND MAGNETO SERVICE

Houston - Dallas - Texas

VIRGINIA

DIESEL INJECTION SALES & SERVICE

Fuel Injection-Governor Specialists

SERVICE SALES: All Makes & Types

814 8th Street, SALEM, VIRGINIA

808 Union Street, NORFOLK, VIRGINIA

TEXAS

Womack Brothers DIESEL SERVICE

Diesel Injection Pump & Nozzle *Sales & Service*

123 W. Carolina, SAN ANTONIO, TEXAS

1302 Caldwell, CORPUS CHRISTI, TEXAS

WASHINGTON

SEATTLE INJECTOR CO.

Fuel Injection Equipment and Accessories for Internal Combustion Engines

Sales Service

2706 Second Avenue, Seattle 1, Washington

Telephone SEneca 2966

ENTERPRISE

★ GENERAL MOTORS — 268-A — 278-A — 567 — 71 ★ FAIRBANKS MORSE OPPOSED PISTON ★

INJECTORS — FUEL PUMPS — PARTS OR EXCHANGE

TIPS — VALVE ASSEMBLIES — PLUNGERS & BARRELS — COMPLETE UNITS

IN BOUGHT — SOLD STOCK

Engine Parts - Crankshafts - Blowers - Heads - Liners - Rings - Pistons - Injectors - Fuel Pumps

IMPORTED BOSCH REPLACEMENTS

GEORGE W. STETSON, JR. 141 MILK STREET BOSTON, MASS.

INTERNATIONAL ★ CATERPILLAR ★ SUPERIOR D ★ ALCO ★ BUDA ★ HERCULES

★ NORDBERG ★

news of our industry

L-W to Build Brazilian Plant

Officials of LeTourneau-Westinghouse Co., subsidiary of Westinghouse Air Brake Co., announce that an operation in Brazil is being established to produce parts and some earthmoving machines. The operating company is named Tratores do Brasil S.A. and will be located near Campinas, about 60 miles from Sao Paulo. It is 75 per cent owned by LeTourneau-Westinghouse.

Commenting, Merle R. Yontz, president of the company, said that the new operation will answer Brazil's need for parts for equipment imported over the past several years, and now difficult to bring into the country because of an unfavorable balance of trade between it and the United States. He added that it was this same type of problem that led LeTourneau to establish its Australian plant in 1941.

Detroit Controls Buys Belknap

Detroit Controls Corp., manufacturer of automatic controls, has announced the purchase of the Belknap Mfg. Co. Belknap, producer of bronze valves, fittings and castings, will carry on operations under its present name as a division of Detroit. Policies and operating personnel of both companies will remain unchanged.

Rolls Royce Work Horse

Rolls-Royce, a name synonymous with luxury limousines, has entered a new field. This famous company is now supplying power for Britain's first heavy track-type tractor, the VR 180.

Pictured here, the tractor, equipped with an open bowl scraper, is doing restoration work during open cast iron ore mining operations in a field at Corby, Northamptonshire. The engine is a supercharged diesel in a body built by Vickers Armstrong. A model of the tractor will be on exhibit at the British Industries Fair, May 3-14.

British Plan Auto Diesel

Turner Mfg. Co. of Wolverhampton, England announced recently that it is planning a range of automotive diesels suitable for automobile application. The engines are of 2-cycle loop-scavenged design and will have power outputs from 40 to 80 bhp, based on a design developed in Austria with aid of Marshall Plan funds.

The engines will be manufactured in 2 cyl and 3 cyl in-line and 4 cyl vee-forms. Each engine develops maximum speed of 3150 rpm with a bore and stroke of 3.54 in and 4.13 in, respectively. Lubrication is by gear-type pump driven from the crankshaft. Oil is by-passed through a relief valve before reaching a full flow filter. Excess oil is by-passed back to sump. Blower is of Rootes type with 3-lobe rotors and is driven from the front end by vee-belts. A flange-mounted fuel injection pump is fitted to a flywheel housing extension.

DR. ALFRED J. BUCHI

Engineering Office
Winterthur, Switzerland.

CONSULTING ENGINEERS

especially for Internal Combustion Engines, Turbochargers, Gas—Generator—Gas Turbines.

LICENSORS

for Internal Combustion Engines, Turbochargers, Centrifugal Compressors and Pumps of own Development and Design.

Control Wheel Slip

(*Continued from page* 107)

axles slipping simultaneously. Significantly, this is not an unusual condition. During the test period it occurred in about 14 per cent of the wheel slips recorded. It is evident, therefore, that a successful slip protection system should compare speeds of all axles, including idle axles, for accurate sensing of multiple axle slips. Since any axle can lock, it is also imperative to compare all axle speeds for sure protection against wheel sliding. This is the type of system now installed on all Lehigh Valley passenger locomotives.

The chart shows the existence of undetected self-correcting slips. Such low-differential, self-correcting slips are best left undetected. They do no harm and operation of the system to correct them would only reduce net horsepower available for traction.

Chart 2, Fig. 8, illustrates slips which occur at low, medium, and high speed when the protection system is not operating.

Results in Service

Experience of Lehigh Valley indicates that since application of the new wheel slip-slide protective system to passenger locomotives, the number of tractor motor removals for rework as a result of flashovers has been reduced 75 per cent. This reduction would probably have been even greater had not a number of motors been weakened through previous excessive slippage. These ultimately failed and required repair.

On these same locomotives, main generator flashovers have been reduced by approximately 80 per cent, with corresponding reduction in maintenance.

After two years of experience with this application in service, Mr. W. E. Lehr, superintendent of motive power of Lehigh, made the following statement: "We have succeeded in eliminating flashovers on traction motors and generators resulting from wheel slippage. One important element in achieving this end was the familiarizing of the enginemen with the equipment characteristics. They are now aware that it is necessary to take proper preventive measures not only in the case of a locked wheel, but also to control wheel slip since the device will automatically protect the locomotive in case of wheel slipping and unload the unit affected. Therefore, they are alert to take immediate action to overcome the slipping and forestall automatic unloading.

"In operating between New York and Buffalo, we now have very little trouble as a result of wheel slippage and we no longer have the needless repair expense formerly caused by high-speed slips."

CRANKSHAFT REPAIRS

SPECIALIZING IN LARGE CRANKSHAFTS

CALL OR WIRE

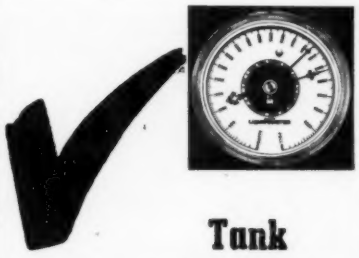
MAIN 2-5242

BRODIE SYSTEM
AN ENGINEERING SERVICE

Shafts brought to standard sizes— no need for undersize bearings

- **REGRINDING**
- **STRAIGHTENING**
- **THERMIT WELDING**
- **METALLIZING**
- **CRANKPINS TURNED OFF IN PLACE**

115 CLIFTON PLACE, BROOKLYN 38, NEW YORK
LARGEST CRANKSHAFT GRINDER IN A JOBBING SHOP



Tank Contents At A Glance

With Liquidometer remote reading fuel storage tank gauges you can check quickly and accurately oil deliveries, consumption and amount on hand. No Diesel plant is complete without one. Liquidometer or Levelometer models are available for tanks of any capacity.

Write for complete information

THE LIQUIDOMETER CORP.

36-24 Skillman Ave., Long Island City, N. Y

MEN TRAINED

IN PROTECTIVE MAINTENANCE AND GENERAL OVERHAUL

Diesel Engines, Tractors and Heavy Equipment

We specialize in the practical phase of training. Shop Method Home study. If you are employed in this field and need better "Know How", or if you are an Employer and need trained Men, Write Today! INTERSTATE TRAINING SERVICE, Dept. A-28-D, 4035 N.E. Sandy Blvd., Portland 13, Ore.

POSITION WANTED

Diesel Technician, age 29, two years college engineering, nine years experience installing, repairing and overhauling diesels and related equipment. Experience covers 10 makes in horsepower sizes ranging from 35 to 7500 in various applications. Thoroughly versed in automotive type engines. Will locate anywhere. Write, wire or phone. James Hill, 14204 Evergreen, Detroit 23, Mich. Phone: Vermont 7-5972

DIESEL ELECTRIC POWER

for IMMEDIATE SHIPMENT

Unit Capacities 100 to 1875 Kva A.C. 50-60 Cycles Various Voltages

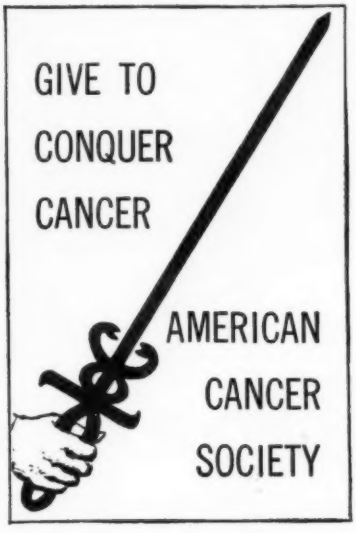
Write or wire today for bulletins and complete information regarding these fine fully guaranteed, low cost DIESEL ENGINE GENERATING UNITS. Visit our plants at Sausalito (S. F.), California, and Jersey City, N. J., and see units in operation on our test stand.

"SPECIALISTS IN DIESEL POWER"

A. G. Schoonmaker Co., Inc.

50 Church St., New York 7, N. Y.

GIVE TO CONQUER CANCER



AMERICAN CANCER SOCIETY

USE BELL INJECTOR CUPS and TIPS

STANDARD AND 21° FOR THE LEADING TRUCK DIESELS

Years of proven service
Volume production on automatic machines means SAVINGS
We pass this on to the consumer
Sold by all parts houses

BELL DIESEL RESEARCH

Pioneers in research and manufacture of high speed diesel injection equipment.
626 W. Colorado Blvd. GLENDALE, CALIF.
Telephone: Citrus 1-4721

D.P.S. THERMOMETERS

These instruments are a series of marine type thermometers designed for all diesels and all plant uses — water-oil-exhaust.

FEATURES All brass construction, nickel finish, cork insulation.

(Repair service available)

No. 416H $5.25 Ea. Price No. 426F $4.50 Ea.

35 years continuously in the diesel engine game.

Write for catalog.

DIESEL PLANT SPECIALTIES CO.

Stevens Point, Wisconsin

Production Reconditioning of GMC and CAT Diesel Fuel Injection Equipment

Plungers and Bushings

GM 71—$ 5.50
GM 567—$10.55
GM 110—$10.55

Complete Injectors

GM 71—$11.90
GM 110—$18.75

Cat pumps—(Any size) $16.00
Cat nozzles—(Any size) $10.70

Dealer propositions

Send in your worn pumps and injectors, to

HANCOCK DIESEL SERVICE

300 Walnut Street Findlay, Ohio

Uniflo EXHAUST MUFFLERS and SPARK ARRESTORS

The Answer to Annoying Exhaust Noise!

"ENGINEERED TO YOUR INDIVIDUAL NEEDS"

*UNIFLO T.M. Reg. *Send for Bulletin # M-728*

MARINE PRODUCTS & ENGINEERING CO.

20 VESEY ST., NEW YORK 7, N. Y. REctor 2-7863

Insist on VELLUMOID for Quality

GASKETS AND SHEET PACKING FOR OIL, WATER AND GASOLINE

THE VELLUMOID COMPANY • WORCESTER 8, MASS.

ADVERTISERS' INDEX

A & D Diesel Service, Inc. 144
Aeroquip Corporation 46
Air-Maze Corporation, The 26
Allison Division, General Motors Corp. 7
American Air Filter Co., Inc. 42-43
American Brass Company, The 30
American Locomotive Co. 64
American Motors Co. 143
Atlantic Metal Hose Co. 141

Bacharach Industrial Instrument Co., Inc. 123
Baldwin-Lima-Hamilton Corp. 38
Beard & Stone 145
Bell Diesel Research 147
Bendix Aviation Corp., Scintilla Div. 6
Blackmer Pump Company 133
Briggs Filtration Co., The 139
Brodie System 146
Brush ABOE, Inc., Petter Engine Div. 17
Buchi, Dr. Alfred J. 146

Carolina Rim & Wheel Co. 144
C. A. V., Ltd. 126
Cedar Rapids Engineering Co. 57
Chicago Pneumatic Tool Company 48
Cities Service Oil Co. 21
Connell Co., W. J. 144
Continental Motors Corporation 45
Coretti-Gross, Inc. 144
Cook Mfg. Co., C. Lee 8-9
Cooper-Bessemer Corp., The 5
Cummins Engine Co. 40-41
Curran Corporation 142

Daimler-Benz Aktiengesellschaft
(Stuttgart-Unterturkheim, Germany) 15
De Laval Separator Co. 4
Detroit Aluminum & Brass Company 22
Detroit Controls Corp. 135
Detroit Diesel Engine Division, Gen. Motors Corp. 13
Dexter Folder Co., Miehle-Dexter Supercharger Div. 33
Diesel Fuel Injection Service Co. 144
Diesel Injection & Governor Service, Inc. 144
Diesel Injection Sales & Service 144, 145
Diesel Plant Specialties Co. 147
Dollinger Corp. 55
Donaldson Co., Inc. 135

Electric Parts & Service Co. 144
Electro-Motive Div., Gen. Motors Corp. 32
Elliott Co. ..... Third Cover
Ellwood City Forge Co. 24
Enterprise Engine & Machinery Co. 10
Erie Bolt & Nut Company 34
Europa Motors, Inc. 120

Fairbanks, Morse & Co. 2
Fairchild Engine & Airplane Corp. 59
Florida Diesel Service Co. 144
Fram Corp. 136

General Motors Corp., Allison Div. 7
General Motors Corp., Detroit Diesel Engine Div. 13
General Motors Corp., Electro-Motive Div. 32
General Motors, Harrison Radiator Div. 20
Gillette & Eaton, Inc. 52
Griffin Equipment Corp. 133
Gulf Refining Co. 11

Hancock Diesel Service 147
Harnischfeger Corp., P & H Diesel Div. 139
Harrison Radiator Div., Gen. Motors Corp. 20
Hartford Machine Screw Company (Roosa Master Division) 14
Henschel & Sohn, Kassel, Germany 23
Hercules Motors Corp. 28
Hilliard Corporation, The 134
Honan-Crane Corporation 140, 141

Interstate Training Service 147

Johnson Bronze Co. 118

Kiene Diesel Accessories, Inc. 121
Kittell Muffler & Engineering Company 60
Klockner-Humboldt-Deutz
(A. G. Kohn, Germany) 58

Liquidometer Corp., The 147
Luber-Finer, Inc. 124

M. A. N. Maschinenfabuk Augsburg-Nurnberg
(A. G. Augsburg, Germany) 56
McCord Corporation 131
Magneto Ignition Co., Inc. 144
Marine Products & Engineering Co. 147
Maschinenbau Kiel Aktiengesellschaft
(Mak, Kiel, Germany) 47
Miehle-Dexter Supercharger Div., Dexter Folder Co. 33
Morse Chain Company 16

National Forge & Ordnance Company 54
National Supply Co. 61
Nickel Cadmium Battery Corp. 115
Nife, Incorporated 132
Nugent & Co., Wm. W. 114

Oakite Products, Inc. 137
Ohio Crankshaft Co., The 35
Oxy-Catalyst, Incorporated 37

P & G Manufacturing Company 49
Parks & Hull 144
Penn Controls, Inc. 127
Petter Engine Div., Brush ABOE, Inc. 17
Pierce Governor Co., The 142
Powers Regulator Co. 27
Precision Parts Corp. 144
Pure Oil Co., The 32A-32B
Purolator Products, Inc. 39

Quincy Compressor Co. 128

Rochester Manufacturing Co., Inc. 138
Roosa Master Division, Hartford Machine Screw Co. 14
Roper Corp., George D. 125

Schoonmaker, A. G., Inc. 147
Schwitzer-Cummins Company 63
Scintilla Div., Bendix Aviation Corp. 6
Sealed Power Corp. 66
Seattle Injector Co. 145
Shell Oil Company 29
Sheppard Co., R. H. 130
Sinclair Refining Co. 36
Snap-On Tools Corp. 119
Snow-Nabstedt Gear Corp. 122
Standard Oil Co., Inc. (California) 18
Standard Oil Co., Inc. (Indiana) ..... Fourth Cover
Sterling Engine Company 19
Stetson, Jr., George W. 145
Stratoflex, Incorporated 138
Sullivan Brothers 144
Synchro-Start Products 31

Texas Company, The ..... 2nd Cover & 1
Thomas Flexible Coupling Co. 140
Tuthill Pump Co. 143

United Specialties Co. 51
U. S. Hoffman Machinery Corp. 117

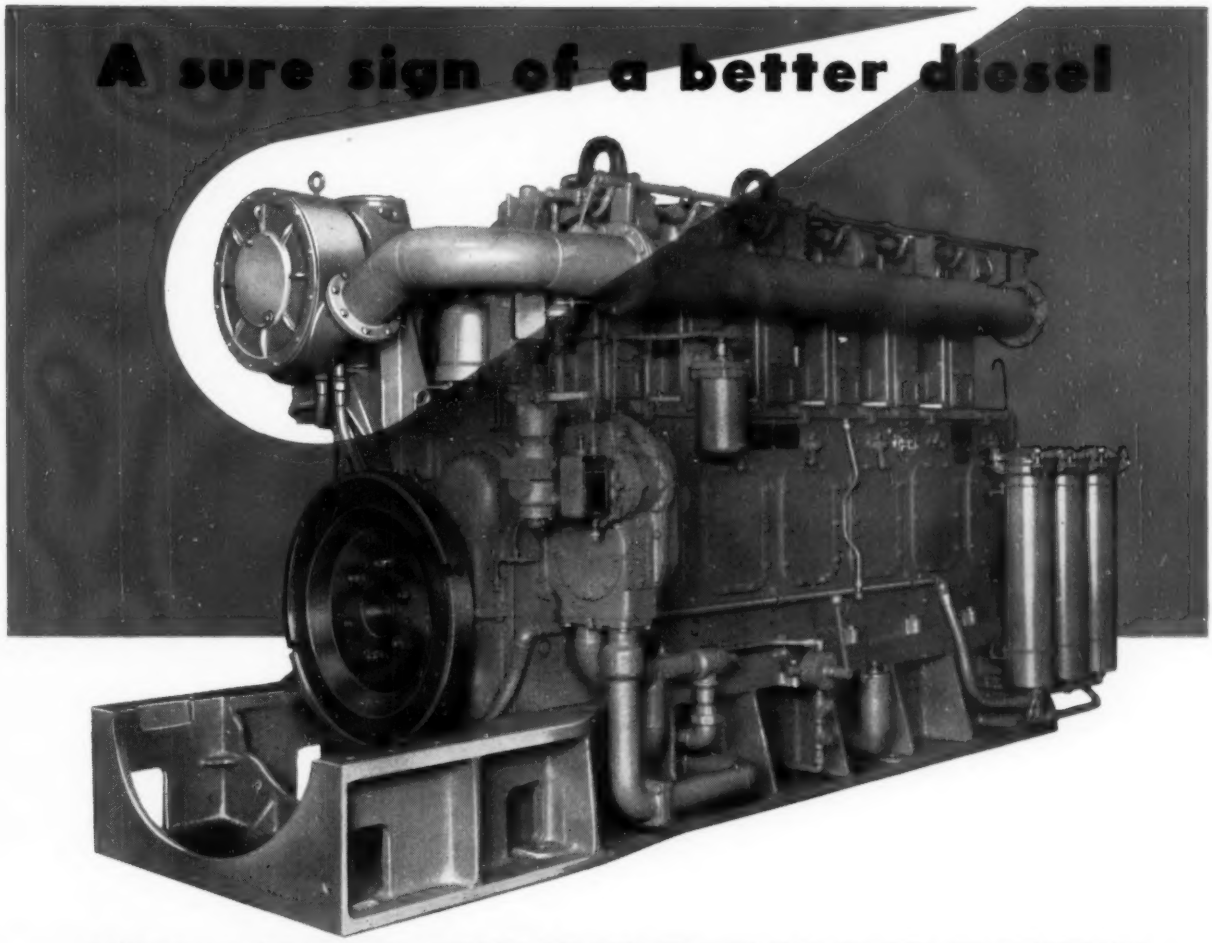
Vellumoid Co. 147
Viking Pump Co. 135

Washington Iron Works, Inc. 129
Winslow Engineering Co. 25
Woodward Governor Company 12
Worthington Corporation 50
Womack Brothers 144, 145

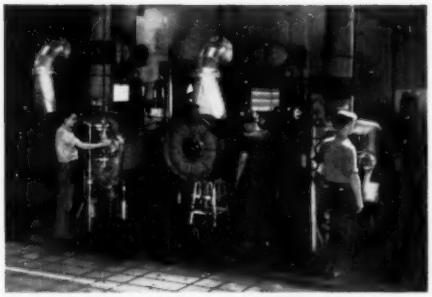
Young Radiator Co. 53

Zollner Machine Works 44

A sure sign of a better diesel



ELLIOTT TURBOCHARGERS



THE TURBOCHARGER TEST LINE

There's nothing experimental about Elliott turbochargers. Elliott has been designing and building them for years and has long since solved the complex thermodynamic and volumetric relationships involved. A comprehensive research and testing program always improves present standards of turbocharging and assures every diesel operator even better performance and value in the years to come.

When a diesel engine manufacturer wants to boost the power and performance of one of his engines, he naturally equips it with an Elliott turbocharger.

There's good reason for this, too. Elliott turbochargers now offer the following outstanding advantages:

- Improved efficiencies
- Higher pressure ratios
- More air flow
- Lower weight/horsepower ratios
- Lower specific fuel rates
- Less lube oil consumption
- Greater capacity to handle overloads
- Better scavenging
- Improved thermal efficiencies

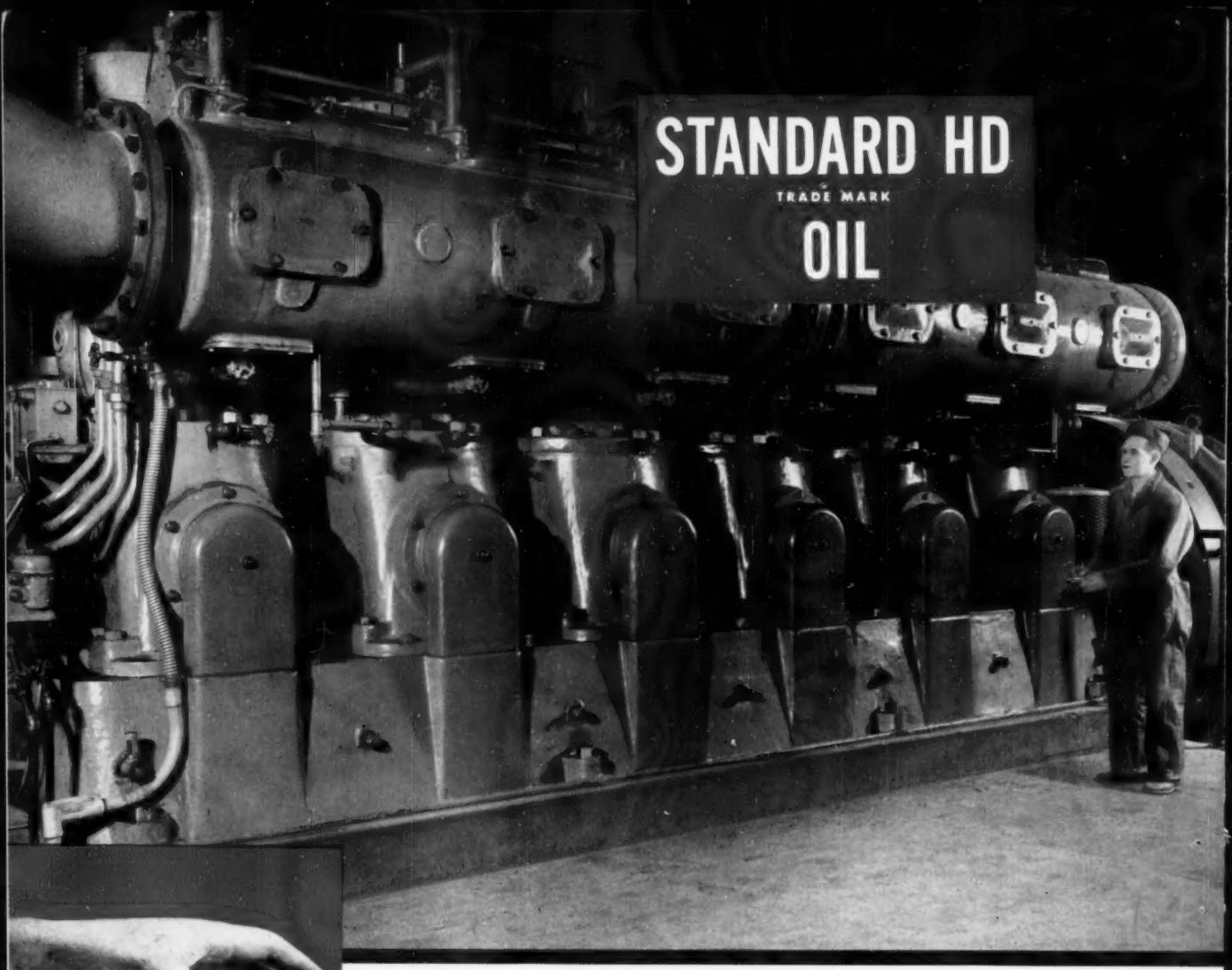
Translated into terms of dollars and cents, Elliott turbocharging means that you stretch your power dollar further – you avoid many costly diesel maintenance problems – and you get longer profit-producing service from your engine . . . all good, sound economic reasons why it pays to specify Elliott turbocharging when you're investing in diesel powered equipment.

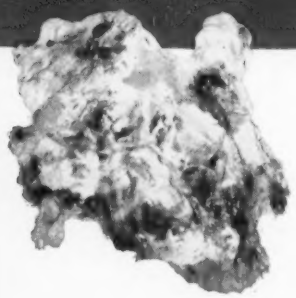
If you'd like further details, write the Elliott Company, Jeannette, Pa.

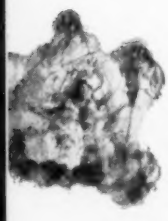
ELLIOTT Company

M4-1

TURBINE-GENERATORS TURBINES MOTORS GENERATORS DEAERATING HEATERS EJECTORS CONDENSERS COMPRESSORS TURBOCHARGERS TUBE CLEANERS STRAINERS







They threw away the cleaning rags!

● When operators of this midwest power plant opened one of their three diesels for an inspection, they reached for their cleaning gear. The six cylinder engine, only two years in operation on an intermittent basis, was ridden with oil deposits from cylinder walls to crankcase. The lubricant used was a well-known product.

Operators took the advice of a Standard Oil lubrication specialist and switched their diesels to STANDARD HD Oil, a truly heavy-duty diesel lubricant.

Periodic analysis of oil samples showed that STANDARD HD maintained its high lubricating quality. Recently, after 5,000 hours' operation on STANDARD HD, the six cylinder engine was opened, once again, for inspection. This time, operators found the engine in excellent condition and entirely clean.

Whether it's cleaner operation, less wear, or more efficient operation you are looking for; the Standard Oil lubrication specialist serving your area of the Midwest has the lubrication engineering ability and the outstanding diesel lubricant to help you reach your goal. You can reach this specialist, easily, by phoning your local Standard Oil Company office. Or, write: Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

STANDARD OIL COMPANY STANDARD *(Indiana)*